



**Yes! In my backyard: Caring for native biodiversity in the city**

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

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# Declaration

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I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics procedures and guidelines have been followed. I acknowledge the support I have received for my research through the provision of an Australian Government Research Training Program Scholarship.

Laura M Mumaw

24 July 2017

# Preface

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This is a thesis ‘with publications’ and is substantially composed of paper manuscripts (either accepted for publication, in review, or in preparation) that report the original research undertaken in this PhD study. These chapters, Chapters 4 through 7, are presented in a format consistent with that used for the thesis and in some cases contain minor editorial changes to the submitted manuscripts. They comprise the thesis’ data chapters, which separately describe the collection, analysis, and discussion of data addressing one of the four secondary research questions that collectively respond to the thesis’ primary research question: How can an urban community foster its native biodiversity and human wellbeing by involving residents in gardening as part of a community biodiversity conservation program? As a result, there is some overlap and repetition, particularly with regards to the description of the case study and methods.

The work contained herein is my own, including developing the research approach and methodology, collecting and analysing data, interpreting the results, and drafting the papers. I designed the conceptual model described in Chapter 5 and developed the community capacity building framework presented in Chapter 7. Supervisors Sarah Bekessy and Cecily Maller provided feedback, guidance, support, and editorial assistance for all papers. Below I outline bibliographical details of this work.

Chapter 4 is a thesis-formatted version of the paper accepted for publication:

Mumaw, L., and S. Bekessy. 2017. Wildlife gardening for collaborative public-private biodiversity conservation. *Australasian Journal of Environmental Management*. <http://dx.doi.org/10.1080/14486563.2017.1309695>.

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# ABSTRACT

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As urban populations continue to grow, cities face the inter-related challenges of fostering community wellbeing and conserving biodiversity. These are usually addressed through disconnected strategies and policies. Biodiversity conservation policies focus on supporting dwindling native species and communities in new ecological assemblages. However many urban land types and land managers are undervalued as conservation spaces and actors, including residential land and residents. Community wellbeing policies look to support physical, mental, and social dimensions of quality of life. While the physical wellbeing benefits provided by nature are often considered, less is understood in terms of psychological or social wellbeing benefits associated with actively caring for nature. How conservation and human wellbeing outcomes might be pursued concomitantly by urban communities is a pressing research and policy question. In this research I ask ‘How can an urban community foster both its native biodiversity and human wellbeing by involving residents in gardening to conserve municipal biodiversity?’

I address this question through an exploratory case study of Knox Gardens for Wildlife (G4W), a program run by a local government (Knox City) and community group (Knox Environment Society - KES) collaboration that involves residents in gardening to help conserve the municipality’s indigenous biodiversity. I employ a qualitative research strategy to examine how the program engages and supports residents in this gardening, how a land stewardship ethic and practice develops, and the effects involvement has on participants’ subjective wellbeing and connections with nature, place, and community. Primary data were gathered through group or individual interviews with thirty-two individuals involved in or associated with G4W, including members, garden assessors, founders, and KES and Knox City officers. This was supplemented with demographic data from G4W members, observations of their gardens, an unpublished Knox City survey of members, and an open-ended questionnaire of garden assessors. I analysed and interpreted the data using inductive, iterative analysis to identify patterns and relationships for further testing. I also developed an assessment framework to explore the program’s impact on Knox community’s capacity to foster biodiversity and wellbeing.

I find that urban residents with diverse gardening styles and demographic backgrounds can be engaged to foster indigenous biodiversity in their gardens through the program, showing opportunity to harness the conservation potential of residential land by engaging residents in municipal conservation collaboration. Yet urban conservation activities have been directed largely to public land, with residential opportunities focused on volunteering on public land, donations, or political support. The program also facilitates urban residents to adopt private land stewardship values and practice, in contrast with speculation that rural environmental place and place meanings

are required. Stewardship development occurs over time through a complex interplay between performing stewardship activities, improving competency and confidence, increasing stewardship knowledge, growing stewardship beliefs and values, and deepening attachments to place and community. I posit a conceptual model for this process and contrast it with linearly depicted pro-environmental behaviour change models, noting their limitations in highlighting how performing pro-environmental behaviour affects its own development and that of other variables.

Social factors were as important as ecological ones in affecting how and why urban residents were engaged in conservation and what benefits were achieved. Instrumental program factors include a face-to-face garden assessment, access to advice and support, locally sited communication hubs, a framework that fosters experiential learning and community linkages, involvement of community and local government, endorsement of each garden's potential conservation contribution, and an indigenous plant nursery. Program participation strengthens wellbeing and social connections amongst involved actors. Feelings of wellbeing come from experiencing nature, sharing learning, developing skills, and making a meaningful contribution to community and nature, catalysts for further action. These findings demonstrate that social as well as ecological benefits can be gained from involving urban residents in municipal conservation through gardening, using an approach that has been poorly understood or targeted previously. They also demonstrate the value of using community capacity to assess and develop integrated approaches to foster biodiversity and wellbeing. I provide a community capacity assessment framework that highlights both social and ecological issues; aids recognition of how human, social, ecological, and economic capital is interactively developed by a program; and helps identify areas for improvement.

# 1 INTRODUCTION

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*Ours is an increasingly urban world...the habits of urban dwellers will largely determine the health of our ecosystems and the survival of biodiversity.*

Secretariat of the Convention on Biological Diversity 2012: 4

## The importance of urban native biodiversity conservation

Cities and the proportion of the world's population living in them continue to grow exponentially. By 2050 it is predicted that almost two thirds of the world's population will be city-dwellers (United Nations Department of Economic and Social Affairs Population Division 2014). Urban settlements disrupt the rich fabric of pre-existing ecosystems in and around them, fragmenting habitat, causing the demise or withdrawal of a number of native species, and introducing new species, particularly plants (Lambin et al. 2001, Kowarik 2011, Farinha-Marques et al. 2011). These impacts can affect the conservation prospects for many species because cities are often established in areas rich in biodiversity (Secretariat of the Convention on Biological Diversity 2012). As a consequence, cities contain numerous threatened species (Aronson et al. 2014, Ives et al. 2016) although they can sustain populations of native species, albeit in new assemblages and altered environments (Kowarik 2011, Ellis et al. 2012). Conservation attention is increasingly being focused on cities (Martin et al. 2014, Corlett 2015) and the International Convention on Biological Diversity formally recognised the importance of cities in conserving biodiversity in 2008 (Puppim de Oliveira et al. 2011).

At the same time there is growing evidence that interacting with nature is important for our physical, mental, spiritual and social wellbeing (Wells and Donofrio 2011, Keniger et al. 2013). Yet urban residents are largely disconnected from nature in their daily lives (Soga and Gaston 2016). In losing contacts with nature in local environments that nurture their wellbeing (Kaplan and Kaplan 2005, Maller et al. 2006), it has been postulated that city dwellers may not form attachments to nature and the impetus to conserve it (Dunn et al. 2006, Soga and Gaston 2016). There have been calls to integrate community wellbeing goals with those for biodiversity conservation (Mcshane et al. 2011, Milner-Gulland et al. 2014) but in cities the many benefits from interacting with nature are poorly considered or integrated in environmental and public health policies (Russell et al. 2013, Mensah et al. 2016). How to harness the potential of cities and their human communities to conserve biodiversity and benefit their wellbeing remains elusive and problematic (Puppim de Oliveira et al. 2011, Shwartz et al. 2014), and is the focus of this research.

## The socio-ecological context

Urban biodiversity conservation takes place in an environment of uncertainty and complexity. Urban environments are comprised of dynamic interactions between and within social and ecological systems, operating across different time and spatial scales and with unclear feedback loops (Folke et al. 2007, Pickett et al. 2011). These are termed social-ecological or socio-ecological systems (Ostrom 2009, Moore et al. 2014). Ongoing human activity means historic native ecosystems cannot always be restored to their prior, pre-urban settlement state (Hobbs et al. 2009). The impact of conservation actions is often unclear, in the short term as well as the long term (Game et al. 2014). Conservation planning, goals, participants, approaches, and evaluation require tailoring to urban settings and will differ from approaches designed for uninhabited landscapes (Hobbs et al. 2013, Morse et al. 2014).

In human dominated landscapes, practitioners have called for multiple, flexible conservation strategies (Chapin III et al. 2010) and for cities in particular, the involvement of local people, community groups and government agencies (Andersson et al. 2014). There are several reasons for this. From an ecological point of view, urban land cover is made up of multifaceted spatial mosaics characterised by different histories and types of land use, overlain with a variety of ownership patterns and governance arrangements, and comprising demographically diverse populations (Kowarik 2011, Pickett et al. 2011). Across this landscape are an array of biotic habitats supporting different patterns of biodiversity (Faeth et al. 2011). Given this fragmentation, conservation targets are reduced in scale from vast landscapes to particular native species or communities, each with their distinctive ecological needs, socio-ecological contexts, and corresponding conservation strategies (Lindenmayer and Fischer 2006).

The urban conservation landscape is often couched in terms of ‘patch, corridor, and matrix’ (Forman 1995). While these terms can be relative in size or location depending on the species or ecological community being discussed, they refer respectively to large areas of habitat of various shapes (patches), habitat linkages that support species movement between patches (corridors), and the heterogeneous landscape within which the patches and corridors sit (matrix). Effective native biodiversity conservation involves maintaining or improving habitat patches and buffers, developing corridors and stepping stones, and improving the habitat quality of the matrix (Goddard et al. 2010b, Threlfall et al. 2016). This requires sympathetic and aligned conservation land management practices by the various individuals and agencies managing the parcels of public and private land that comprise the conservation landscape (White et al. 2005, McCaffrey and Mannan 2012, Ikin et al. 2016).

From a social perspective, there is a range of societal forces and actors shaping the composition of urban biodiversity. Urban residents have an impact, deliberate or otherwise, through

their daily lives and in their environmental actions. Historically engaging the public in conservation in urban areas has focused on giving city dwellers opportunities to interact with nature in their neighbourhoods and teaching them about nature conservation to build their conservation awareness, values, pro-environmental behaviours and political support (Miller and Hobbs 2002, Dunn et al. 2006, Hall et al. 2017). Equally, if not more important is getting residents actively involved in the *doing* of biodiversity conservation (Schwartz 2006): volunteering in local parks and reserves (Dearborn and Kark 2010), improving habitat in their gardens (Doody et al. 2009, Goddard et al. 2010a), knowledge gathering and sharing (Robbins and Moore 2013), for example through citizen science (Cooper et al. 2007), and interactively shaping values for what should be conserved and how as part of the doing (Norton 2005, Dillon et al. 2016). Personal involvement in caring for the environment can reinforce continuation and deepening of that behaviour through development of hands-on knowledge and skills (Hines et al. 1987, Hungerford and Volk 1990), experiencing positive feedback (Kollmuss and Agyeman 2002) including success of one's actions (Hines et al. 1987), and gaining feelings of capability and competence (Chawla and Cushing 2007). Empirical evidence is growing that successful community-based conservation requires the involvement of networks of community members, community groups, and public agencies with facilitative leaders and linkages between them, and a collaborative approach to problem-solving that builds trust and respect (Ansell and Gash 2008, Andersson et al. 2014, Curtis et al. 2014, Metcalf et al. 2015).

Many land types in cities are undervalued as conservation spaces, including residential holdings. There is poor engagement and networking of diverse land users with capacity for conservation (Ernstson et al. 2010). In developed countries particularly, conservation is often disconnected from residents' daily lives, seen as the province of experts or paid professional staff (Adams and Mulligan 2003). An extensive review of urban biodiversity conservation papers concluded that there is still little evidence for how to increase city dwellers' interactions with biodiversity, how to develop their conservation awareness and behaviour, and what the associated wellbeing benefits might be (Shwartz et al. 2014).

Through this research I seek to provide insights into *how an urban community can foster both its native biodiversity and human wellbeing by involving residents in gardening to conserve municipal biodiversity*. I conclude this section by outlining why I chose gardening as the conservation activity to study, how this might relate to land stewardship, what dimensions of wellbeing I chose to explore, and why I used community capacity building as the concept by which to explore the impact of community actions on fostering both biodiversity and human wellbeing. I then overview the research design and questions, and outline the thesis structure.

## Gardening as a potential conservation activity and form of land stewardship

Residential gardens, private plots of land around or beside residential dwellings (Loram et al. 2007), are important sites for native biodiversity conservation and its study for three key reasons. First, they comprise a sizable proportion of land in cities, suggested to be the largest component of urban greenspace (Mathieu et al. 2007) (for example measured as 36% of the area of Dunedin, New Zealand (Mathieu et al. 2007) and between 22% to 27% in five major UK cities (Loram et al. 2007)). Second, gardens can play a meaningful role in conserving native flora and fauna (Hunter 2005, Doody et al. 2009), particularly when they are managed to do so, a practice defined here as wildlife gardening (Goddard et al. 2010b). Wildlife gardening activities include removing environmental weeds (Smith et al. 2006), adding habitat structure and features like shelter or nesting sites and planting indigenous flora (Goddard et al. 2010b), and nurturing indigenous regrowth (Doody et al. 2009). As noted previously, to be effective, these activities should be complemented by conservation management of other neighbourhood landscape features, many of which are the responsibility of public land managers, such as protection and enhancement of native habitat in parks and reserves (White et al. 2009, Standish et al. 2013) and improving connectivity along streams and roadsides (van der Ree 2009, Ikin et al. 2013).

Third, and perhaps most importantly, gardens are accessible to most people; 85% of Australian households report they have gardens (Australian Bureau of Statistics, 2012), as do 87% of UK households (Davies et al., 2009) and 78% of USA households (Clayton 2007). Gardening is an activity that many urban residents can and do participate in, without requiring involvement in a social group or being away from home. As a common domestic practice that involves ‘the rewarding and productive engagement with other life forms and the opportunities to exercise virtues of nurture and care’ (Holland 2006: 133), gardening could be an effective platform for engaging residents in the conservation of the native species of ‘their’ place. This approach aligns with calls to foster nature conservation by understanding what relations and relational values people have with nature and building on them (Turnhout et al. 2013, Chan et al. 2016). In Australasia, attitudes to native species in urban gardens, particularly to support wildlife, does not appear to be a barrier to wildlife gardening practice, with the exception of: introducing venomous or pest wildlife (Davies and Webber 2004); planting or keeping native trees that reduce amenity or safety, e.g. by reducing sunlight (Doody et al. 2009) or dropping branches (Davison and Ridder 2006); or the weediness and perceived messiness of some native plantings (Uren et al. 2015). Indeed, in Australia, 43% of people living in capital cities reported that they had planted or cared for Australian native trees or plants at home; the most common reasons given were: making the garden more attractive and tidy (69%), enjoyment (68%), nature conservation (44%), support for local environment (40%), saving water (35%) and helping animals (28%) (Australian Bureau of Statistics 2013). In one New Zealand study, 54 percent of participants were prepared to plant indigenous species in their gardens, 84 percent agreed that

indigenous New Zealand species are ‘important to our identity’, and 81% felt that ‘native plants are attractive’ (Doody et al. 2009: 1395).

While the potential conservation value of improving habitat for native species in one’s garden has been recognised (Rudd et al. 2002, Goddard et al. 2010b), there are very few studies about how to develop this practice (Freeman et al. 2012, Goddard et al. 2013, Dahmus and Nelson 2014), its effectiveness (Nilon 2010), or its relationship to human wellbeing. Three studies have reviewed aspects of wildlife gardening programs, including communication strategies (Palmer and Dann 2004) and the quality of wildlife habitat in participants’ backyards (Widows and Drake 2014) in a USA program, and the prevalence of members’ connectedness with nature (Shaw et al. 2013) and recruitment approaches (Shaw and Miller 2016) in eight Australian wildlife gardening programs. No previous studies have explored the cultivation of wildlife gardening, nor the role of public and private land management (and their alignment) in this context. For all these reasons I investigated how to engage and support residents in gardening to improve habitat quality for the native flora and fauna of the region through a municipal conservation program. My findings, including key factors supporting this process, are reported in Chapter 4.

I was also interested in why residents undertake wildlife gardening, and whether their purposes come to include caring for their land and its flora and fauna as a contribution to improving the broader landscape, for the benefit of the community as well as for nature. I used a concept of land stewardship I derived from features articulated by Aldo Leopold in his seminal essay *The Land Ethic* (Leopold 1949: 201-226). My definition is:

*Caring for the ability of the land in a geographically situated place to support nominated species or communities of flora and/or fauna to persist across the surrounding landscape, as a matter of personal responsibility, for future generations [of persons and wildlife].*

Leopold applied the concept of stewardship to private rural landholdings and accepted that it could be done simultaneously with other land management purposes like agriculture, by caring for the land sensitively while supporting the continued existence of native species ‘and, at least in spots, their continued existence in a natural state’ (Leopold 1949: 204). This concept of land stewardship is generally not applied to urban contexts like gardening. Here I studied whether urban residents can develop land stewardship purposes, materials and activities for their gardening, the impacts on their connections with place and community, and how this might be fostered. I found that this is so and describe a model for the stewardship development process (Chapter 5), outlining implications for fostering urban biodiversity while building connections with place and strengthening the social fabric of a community.

## The relationship between wildlife gardening and wellbeing

Improving the wellbeing of citizens is a priority of governments the world over (Mensah et al. 2016, Austin 2016) but importantly, human wellbeing is context specific and can vary over time (Kapteyn et al. 2015, Woodhouse et al. 2015). While what constitutes wellbeing and how to measure it continue to be debated (Austin 2016), there is concurrence that wellbeing has both objective and subjective dimensions, from the physical to the psychological, social and spiritual (La Placa et al. 2013, Milner-Gulland et al. 2014). There is also some consensus on ‘markers’ of wellbeing, that is ‘things that are either constitutive, productive or indicative of well-being’ (Taylor 2015: 75) including social relationships (Milner-Gulland et al. 2014), happiness, health, life-satisfaction, and personal development (Dolan et al. 2011, Taylor 2015).

The physical wellbeing benefits provided to communities by nature, generally termed ecosystem services (e.g. food, shade, air and water purification), are often valued and quantified economically (McDonald 2015). Less is understood about the social, psychological, or cultural wellbeing benefits of nature and calls have been made to better consider and integrate these benefits in environmental and public health policies (Wells and Donofrio 2011, Russell et al. 2013). Indeed, psychological, cognitive, physiological, social and wellbeing benefits are reported from experiencing nature, including reduced anxiety, improved mood, attention restoration, improved cognitive function, and social cohesion (Maller et al. 2006, Keniger et al. 2013). Many of these studies relate to experiencing nature in urban green spaces, and underpin recommendations to increase urban dwellers’ access to public green spaces (Mensah et al. 2016). Hands-on caring for nature, for example through gardening, provides additional wellbeing benefits of self-esteem, self-efficacy, and achievement, associated with being creative and tending nature (Bernardini and Irvine 2007, Clayton 2007). Volunteering in nature improvement programs can produce wellbeing benefits of knowledge growth, a sense of pride and place, and feelings of purpose and achievement by caring for nature and helping the community (Burls 2007, Husk et al. 2016).

I explored the subjective feelings of wellbeing participants derive from being engaged in wildlife gardening as a community conservation activity. The confluence of experiencing nature, gardening, and doing so for a conservation purpose and as part of a community effort, would seem to offer a rich palette of potential wellbeing impacts but has been little studied. I procured informants’ perspectives that are ‘nuanced, context-contingent, largely self-defined conceptualizations of well-being’ (Milner-Gulland et al. 2014: 1164-1165): in their responses to prompts about wellbeing derived from their wildlife gardening; and in their described feelings of reward; happiness; learning; purpose; and connections to nature, place, or community associated with their participation. I describe these wellbeing impacts in Chapter 6.



## The importance of community capacity building

Traditionally the overarching outcome measures used to plan and evaluate conservation programs have been ecological, related to increasing the probability of persistence of native ecosystems, habitats or populations in the wild (Kapos et al. 2009, Lamoreux et al. 2014). In the dynamic and human dominated urban context, ecological solutions are often unclear and meaningful time-bound performance measures difficult to establish given the complex nature of socio-ecological systems (Folke et al. 2007, Game et al. 2014). Conserving biodiversity in urban landscapes fundamentally depends on the community and its desire and capacity to care for biodiversity. This requires social relationships, multi-party collaborations, and social learning (Bouwen and Taillieu 2004), including about what environmental outcomes might be possible and what is desired (Bromley 2012), and building the capacity to respond to future challenges (Vare and Scott 2007, Whitmarsh et al. 2012). Factors deemed to enable conservation contexts or activities have been elicited from conservation practitioners, couched as forms of natural, human, social, economic, or institutional capital or capacity (Moore et al. 2006b, Bottrill and Pressey 2012, Mountjoy et al. 2013a). While having these forms of capital or capacity does not necessarily result in desired conservation outcomes, they have been suggested as alternative indicators of conservation success to ecological indicators alone because they lead to more and/or better actions to address the problems (Kapos et al. 2009, Mountjoy et al. 2013b). Although systems frameworks have been proposed for the evaluation and planning of conservation programs (Ban et al. 2013), there are few available in the literature and none that incorporate wellbeing as an explicit and desired co-outcome with species conservation.

The concept of community capacity building, used in the community development and health literature, involves mobilising various forms of capital in an iterative interacting process for the benefit of the community (Simmons et al. 2011). Three features inherent in various definitions of community capacity building make it suitable as a framework for considering the impact of wildlife gardening on conservation and community wellbeing: 1) the inclusion of social actors and their interactions as elements of community capacity, 2) the notion that community capacity is an outcome as well as a means of capacity building, and 3) attention on the *process of deploying* forms of capital that lead to outcomes (Mendis-Millard and Reed 2007, Wendel et al. 2009, Simmons et al. 2011). Although employment, housing, civic engagement, or physical health are the outcomes that are the typical focus of community capacity building literature, I consider that biodiversity conservation could be included as a desired outcome, and natural capital (e.g. ecological habitat, genetic material in plant nurseries) added to the forms of capital required to achieve the outcomes.

I chose Chaskin's (2001) seminal definition of community capacity in relation to community capacity building to develop a framework for mapping and evaluating the findings from my research,

as detailed in Chapter 7. What particularly appeals in Chaskin’s (2001: 295) definition is his explicit articulation of community wellbeing as a desired outcome:

Community capacity is the interaction of human capital organizational resources, and social capital existing within a given community that can be leveraged to solve collective problems [in our case conservation of native biodiversity] and improve or maintain the wellbeing of a community.

Using this framework allows a snapshot to be created, derived from various actors’ perspectives, of the impacts of wildlife gardening on the various ecological and social resources and actions of a community in relation to fostering its native biodiversity and wellbeing. The framework can be used to consider the impact of programs (either post-hoc or ex-ante) on achieving both conservation and wellbeing outcomes.

## Research approach

I used a pragmatic research approach as described by Feilzer (2009), selecting methods oriented toward ‘solving practical problems in the “real world”’, and accepting that there are ‘singular and multiple realities that are open to empirical inquiry’ (Feilzer 2009: 8). The key determinants of my approach are 1) my research questions; 2) the availability of a revelatory case study (Yin 2009: 48-49); 3) my philosophical knowledge assumptions; and 4) the scope of a PhD study. I describe the first three below, followed by a brief description of data collection and analytical methods. A detailed account of the methodology is provided in Chapter 2.

## Research questions

The purpose of my research is to provide useful insights into how an urban community can foster its native biodiversity and wellbeing by involving residents in gardening to conserve municipal biodiversity. The overarching question is: *How can an urban community foster its native biodiversity and human wellbeing by involving residents in gardening as part of a community biodiversity conservation program?* I address this by asking four research questions, shown in Table 1-1, using a purposively chosen case study:

**Table 1-1. Research questions**

- |   |
|---|
| <ol style="list-style-type: none"><li>1. How does a community wildlife gardening program engage and sustain residents to wildlife garden to conserve municipal native biodiversity?</li><li>2. Do participating residents develop a land stewardship ethic and practice, and if so how?</li></ol> |
|---|

3. What are the impacts of participation in a community wildlife gardening program on participants' wellbeing and connections with place, nature, and community?
4. How does a community wildlife gardening program strengthen its community's capacity to foster its native biodiversity and wellbeing?

### Use of a revelatory case study

While seeking information and examples of urban wildlife gardening programs involving residents and local government working together, I discovered one program, Knox Gardens for Wildlife (G4W) that was a particularly suitable case study for the research. A case study strategy is suited to answering 'how' questions about a contemporary phenomenon in its real-life context, where the investigator has little control over events (Yin 2009: 2, 13). G4W is an example of an operating partnership between the primary public land manager of a municipality (Knox City) and a local community group (Knox Environment Society - KES) that involves and supports residents to wildlife garden as part of a landscape-focused biodiversity conservation initiative. In addition to being a contemporaneous example of wildlife gardening embedded in a community partnership, G4W provided opportunities to explore temporal and social dimensions of such a program. Operating and growing since 2006, at the time of data collection G4W had 500 local households (at the time of writing 700 households) and members whose involvement in the program ranged up to 8 years. Social interactions were provided by way of personal garden assessments and events like 'open-garden' days. All these program features, unusual in operation and little studied, qualify G4W as a 'revelatory' single case study (Yin 2009: 48-49). A more detailed description of G4W and its socio-ecological context is provided in Chapter 3.

### Knowledge assumptions

In terms of human beliefs and behaviour, I assume that people's beliefs, actions and feelings, such as wellbeing, arise from their lived experiences, cultural background and individual mode of interpretation (Moses and Knutsen 2007, Blaikie 2010) and that my interactions with informants influences their interpretation and responses to my questions (Richards and Morse 2013). In terms of ecosystems, I assume that there is an objective reality about them that exists independently of people's perceptions and can be tested theoretically, although their underlying nature remains uncertain given the variability in individual plant and animal responses to the physical world (Moses and Knutsen 2007, Moon and Blackman 2014).

My research approach is empirical and qualitative. I used an inductive analytical strategy (Feilzer 2009, Bryman 2016: 379) in which my initial exploration led to ancillary questions and further data collection and analysis. I identified patterns and relationships, and developed a conceptual stewardship model for further investigation and testing (Corbin and Strauss 2008, Bryman 2016). Details of the philosophical basis of the research and its methodology are provided in Chapter 2.

## Data collection and analysis

Data were primarily gathered through group and individual interviews and supplemented by a demographic questionnaire of G4W members, observation of their gardens, and an open-ended questionnaire of garden assessors. It was analysed by interpreting themes and patterns in the interview responses using an inductive, iterative analytic approach (Thomas 2006, Hood 2007) similar to that used in grounded theory approaches (Charmaz 2014). I also used data from an unpublished Knox City survey to position the primary interview findings by assessing commonalities and differences between the interview and survey data sets at several reference points. Table 2-2 (p 22) provides an overview of the data sources, collection and analytical methods used to generate findings to respond to the research questions.

Thirty-two individuals involved in or associated with G4W participated in the research between 2014 and 2015 through group or individual interviews. Informants included G4W founders, coordinators, garden assessors, and members; Knox City managers; and officers of the community group KES. I also used G4W program materials and information about Knox City available on the internet or in published documents to understand G4W features and procedures, and the social and ecological context of Knox City. Methodological details are provided in Chapter 2.

## Thesis structure

The purpose of this research is to provide useful insights into how an urban community can foster its native biodiversity and wellbeing by involving residents in gardening as part of a community biodiversity conservation program. This thesis is comprised of 8 chapters as detailed below, commencing with an introduction and methodology chapters, a chapter describing the case study, then four data chapters, and ending with a discussion/conclusion chapter. The data chapters, Chapters 4 through 7, each describe the collection, analysis, and discussion of data responding to one of the four subsidiary research questions. These chapters are written as papers for journal submission and each includes its own methods section and topic-specific literature review. They are formatted to be consistent with the other thesis chapters and their references are incorporated in a consolidated reference list at the end of the thesis. A short preface at the end of Chapter 3 introduces these data chapters. The concluding chapter summarises the research findings, providing a coherent and

integrated response to the research questions, and explaining their significance for theory, policy and practice.

In **Chapter 1, Introduction**, I outline the importance of urban biodiversity conservation, the research context, and the rationale for the key foci of the research, with an associated literature review. I also summarise the research approach and questions, and the thesis structure.

In **Chapter 2, Methodology**, I describe: the philosophical context of the research, including my knowledge assumptions and the research design and methodology, including its rationale, limitations, and issues of quality.

In **Chapter 3, Knox Gardens for Wildlife**, I briefly describe the case study organisation and its socio-ecological setting to contextualise the research findings. I then introduce the four data chapters.

**Chapter 4 - Wildlife gardening for collaborative public-private biodiversity conservation.** In response to research question 1, I provide empirical evidence for how the case study program involves and supports residents to continue wildlife gardening as part of a landscape-focused collaborative conservation effort. I describe the key program features implicated in this change and compare these with various factors reported to stimulate environmental stewardship behaviour.

**Chapter 5 - Transforming urban gardeners into land stewards.** In response to research question 2, I provide evidence that some members develop a land stewardship ethic and practice. Using inductive analysis I posit a model for how the stewardship development process occurs, including the role of specific features of the program in this process. I compare this model to other pro-environmental behaviour change models, noting the particular importance of recognising relationships that occur between factors over time.

**Chapter 6 - Strengthening wellbeing of urban communities through wildlife gardening.** In response to research question 3, I describe the experiential, social, and eudemonic types of wellbeing benefits reported by participants from their involvement in the case study program, including strengthened connections with nature, place and community. I note that demonstrable local government and community participation, shared purpose, a social framework, and endorsement of the conservation contribution of participants are factors underpinning these benefits. The findings affirm the importance of embedding urban nature conservation programs in interactive social contexts, and of planning and evaluating conservation programs for wellbeing and social benefits rather than ecological purposes alone.

**Chapter 7 - The critical role of community capacity for urban conservation.** In response to research question 4, I develop a community capacity building framework and use it to map the impact of the case study program on strengthening and deploying various facets of community capacity that foster its native biodiversity and wellbeing. I discuss how applying the framework for conservation program evaluation supports shared learning about the program's impact from an integrated social and ecological perspective, and longer term consideration of how to improve a community's prospects for conservation and wellbeing.

In **Chapter 8 – Conclusion**, I summarise the findings from each of the previous four data chapters, draw overarching conclusions, and explain their significance. I discuss implications for theory and policy and practice, and recommend areas for further research.

## 2 METHODOLOGY

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*The journey of a thousand miles begins with a single step.*

*Attributed to Lao Tzu, Chinese philosopher, 604-531 BC*

### Introduction

In this chapter I describe the research design and its rationale in detail: 1) the philosophical context and knowledge assumptions underpinning the research strategy; 2) the use of a case study-based qualitative methodology and an inductive analytical strategy; 3) the specific data collection and analytical methods associated with each research question; and 4) how quality was addressed.

### Philosophical context

This research project considers issues in both the ecological and social disciplines. I selected a research strategy suitable to address my research questions and ‘pluralistic’ knowledge assumptions, in this case, my different views about nature and human/social aspects of the world, and how knowledge about each of them can be obtained (Moses and Knutsen 2007: 6). Such an approach was proposed by Blaikie (2010: 97): ‘the choice of a research strategy does not necessarily entail a commitment to a particular research paradigm’ but should be based on an informed choice that reflects one’s ontological assumptions, procedures suited to answering the research questions, audiences for the research, and pragmatic considerations (Blaikie 2010: 107-108). My philosophical approach most closely resembles the research paradigm of pragmatism, as set out by Feilzer (2009: 8): ‘Pragmatism, when regarded as an alternative paradigm, sidesteps the contentious issues of truth and reality, accepts, philosophically, that there are singular and multiple realities that are open to empirical inquiry and orients itself toward solving practical problems in the “real world”. Below I discuss my knowledge assumptions and the implications for this study.

In terms of the natural world, I believe that there is an objective reality existing independently of people’s interpretation of it. This reality is not governed by set, mechanistic rules but accommodates the independent responses of plants and animals to the physical world (called ‘vital force’ by Moses and Knutsen 2007: 168), and can be described and understood using objectivist natural science methods. This reality may not reflect the opinions, perceptions or experiences of all informants (for example, whether wildlife in an area has increased or not). I did not draw conclusions about changes in ecological composition or health based on lay informants’ narratives. Instead, I considered ecological outputs to be those actions they had undertaken that are currently deemed important by ecologists to support indigenous biodiversity - for example, adding nest hollows or removing species considered to be invasive environmental weeds. I also attempted to

ascertain whether people's stated gardening actions aligned with their narratives by observations of their gardens, freshly planted material, and pots waiting to be planted.

In terms of the human world, I believe that people create their own knowledge and reality via their lived experiences and contexts, and that this influences their behaviour. By interpreting individuals' explanations of their opinions, feelings, activities and the development of them in relation to the world around them, I can derive insights that address my research questions of how to engage residents in wildlife gardening and what the impacts on participants, including feelings of wellbeing and attachment, might be. My interaction with informants in the course of the research and the context within which questions are asked becomes part of the data making. In this sense the qualitative data generated for this research was 'made' from the interviews rather than 'collected' (Richards and Morse 2013: 119). I make the context of the case study (refer Chapter 3) and my personal motivation and role as researcher (refer section Role of researcher, p 20) transparent so that my findings may be interpreted and considered with these in mind (Layder 1998, Blaikie 2000). I discuss how I addressed quality, given these assumptions, in the section Quality (p 31).

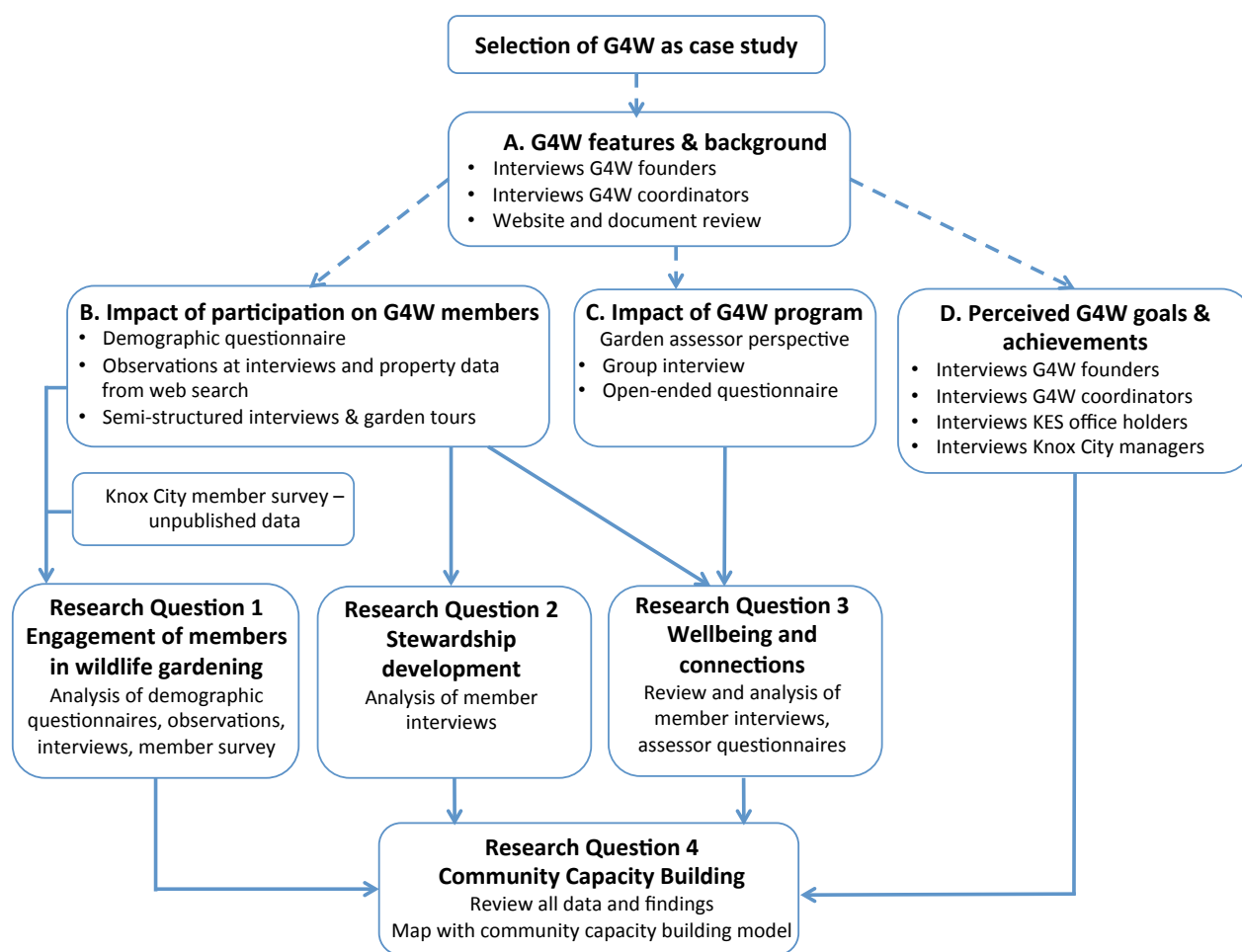
I believe that socio-ecological features are time and site specific. The findings from this study are not generalisable to all populations and contexts. Instead, patterns and relationships revealed by the research are for consideration and use by practitioners in relation to their own contexts (Bassey 1981, Corbin and Strauss 2008, Blaikie 2010: 193) and for further testing and investigation. I discuss scope and generalisation at the end of this chapter.

## Research strategy

My research strategy was aligned with my knowledge assumptions as described above; the availability of a revelatory case study; my research questions (Table 1-1, p10), that themselves shape and respond to the data; and the scope of a PhD study. The research was empirical and I used an inductive analytical strategy (Feilzer 2009, Bryman 2016: 379) in which initial exploration led to ancillary questions and further data collection and analysis. Figure 2-1 provides a diagrammatic overview of the research strategy as an outline for how it will be described in this section: the selection of the case study; the four categories of data sought (lettered A-D) and within these categories, the methods used to collect/make the data; and the research questions (numbered 1-4) which the data sets addressed, with the analytical methods used to do so. In the ensuing parts of this Research strategy section I first describe the selection of the case study, ethical conduct of the research, and my role as researcher. I then describe the data sought, from whom and how it was collected or made, and the rationale for the methods. I conclude with how the different data sets were analysed to respond to each of the research questions.



**Figure 2-1. Relationship between data sought, data collection/making and analytical methods, and research questions**



### Selection of case study

I used a case study of a purposively chosen wildlife gardening program as the vehicle for the research. A single case study is appropriate for investigation of ‘a contemporary phenomenon in depth and within its real life context, especially when the boundaries between phenomenon and context are not clearly evident’, one has little control over the behavioural events or context, and the phenomenon is little studied (Yin 2009: 18). I was able to find a ‘revelatory’ case study exemplifying the purpose, features, and context that are the subject of the research (Yin 2009: 48-49) while I was in the process of canvassing academic literature and websites, and having discussions with biodiversity managers in local governments about extant wildlife gardening programs involving residents and local government working together.

Knox Gardens for Wildlife (G4W), the case study, is an operating partnership between a local government, the primary public land manager of a municipality (Knox City), and a local community group (Knox Environment Society - KES), that involves and supports residents to wildlife garden as part of a landscape-focused biodiversity conservation initiative. KES promotes the local environment

and runs an indigenous plant nursery that is a key feature of the program. G4W members are residents (or businesses on local premises) that join G4W by signing up online or by post. Members receive an on-site garden visit by garden assessors who explain the program's purpose, identify environmental weeds and indigenous biota in the garden, and describe specific opportunities for wildlife gardening. Garden assessors are either Knox City staff or G4W volunteers (often G4W members). More detail about G4W and its operation are found in Chapter 3.

In addition to being a contemporaneous example of wildlife gardening embedded in an urban local government-community partnership, G4W has a number of features that made it a desirable case study to address the research questions: the interest of responsible parties in the research; recruitment of residents as participants since 2006; a variety of program features, including face-to-face interactions, whose significance could be tested; participants with different demographic characteristics and length of time in the program, enabling these factors to be explored; known proximities of participants to mapped areas of biological significance; and practitioner interest in the program. These are detailed in Table 2-1 (p 19).

**Table 2-1. G4W features desirable in case study**

Desirable in case study	G4W Features
<b>Accessible for research</b>	G4W partners and coordinators interested in participating
<b>Recruitment of household participants over a number of years</b>	G4W began in 2006, membership 500+ households growing by 50-70 households per year
<p><b>Opportunities to explore:</b></p> <p>Program impact on demographically diverse urban residents</p> <p>Effect of variety of program features, including social interaction with various program actors</p> <p>Effect of different time periods of involvement</p> <p>Spatial issues</p> <p>Ecological context and impact</p>	<p>G4W has 600+ households across municipality as members (in 2016)</p> <p>G4W has features including</p> <ul style="list-style-type: none"> <li>• Easy-to-visit indigenous plant nursery run by KES</li> <li>• Face-to-face garden assessments</li> <li>• Optional social activities for members (e.g. ‘open garden’ days)</li> <li>• Grants for properties of suitable quality and proximity to site of biological significance</li> <li>• Regular newsletters and Facebook postings</li> </ul> <p>G4W began in 2006, members with up to 8 years involvement at time of data collection (2014)</p> <p>Position of members mapped on Knox City database with ability to overlay other mapped features</p> <p>Knox City has identified and described all sites of biological significance (flora) it is responsible for - public and private (where accessible) - report publicly available (Lorimer 2010a, 2010b)</p>
<b>Program relevance and applicability</b>	Knox City and KES advertise G4W on their websites and commit resources to it; G4W linked to Knox City’s biodiversity strategy; practitioner interest in program

In addition to using the case study to gain insights for the development of concepts for further testing (de Vaus 2001, Blaikie 2010), the findings were intended for practitioners to evaluate and use for their needs (Bassey 1981, Corbin and Strauss 2008). It was therefore important to describe the details of the case study as advocated for pedagogical research:

An important criterion for judging the merit of a case study is the extent to which the details are sufficient and appropriate for a teacher working in a similar situation to relate his decision making to that described in the case-study. The relatability of a case-study is more important than its generalisability (Bassey 1981: 85)

This concept is sometimes called transferability (of findings to other milieux) (Bryman 2016: 384) and is discussed in the section on Quality (p 31). A description of Knox Gardens for Wildlife is provided in Chapter 3 to assist with issues of reliability.

### Ethical conduct

This research was conducted following the Australian guidelines for ethical conduct in human research (Australian Government 2007). The project and its methodology were approved by a sub-committee of the RMIT University Human Research Ethics Committee (DSC CHEAN A 0000017158-01/14). The ethical guidelines require treating participants with sensitivity and respect, maintaining their confidentiality, receiving their voluntary and informed consent, providing them the opportunity to withdraw at any time, and meeting strict protocols for the handling and storage of all information received from them. The information and consent sheet for G4W members is attached as Appendix 1. Similar material was provided to other interviewed informants with details relevant to their particular involvement in the research. The letter of approval for the research from the Ethics Committee is attached as Appendix 2. Informants will be provided with a summary of findings from my research at the conclusion of the project; I also updated informants with interim findings as described in the section on Quality (p 31).

### Role of researcher

As explained earlier, I did not play the role of impartial research observer. In discussions with all informants I explained my interest and support for the practice of wildlife gardening, and that I was investigating G4W as a case study to understand how it did and might better contribute to conserving native biodiversity. This perspective was also outlined in the research information sheet (Appendix 1) provided to all potential informants in advance. My background and previous interests as a zoo director in engaging people with nature and conserving biodiversity were also provided in advance by email to prospective informants.

I answered questions asked of me by informants honestly and to the best of my ability. During interviews with G4W members, and particularly on garden tours with them, our conversations were rich and interactive. If I saw something of interest or felt a response did not fit with other comments or what I saw, I would convey my interest and seek further explanation. I sought narratives from informants that expressed their thoughts and feelings in their own words, in relation to their lives currently and over time.

I sought throughout this research to faithfully present the narratives of the informants, recognising that I interpreted aspects of their stories in categorising them under representational themes. I carefully considered my role as interpreter of the data through 'critical self-scrutiny' and

'active reflexivity' (Mason 2002: 7), endeavouring to record patterns as they emerged from the data and to avoid inadvertently finding what I might 'want to find'. To assist in checking my understanding, I discussed my findings with program coordinators through the course of the research. I also presented interim findings to informants. I discuss this issue in more detail in the section on Credibility (p 32).

## Data collection, making and methods

Table 2-2 (p 22) shows an expanded version of the research strategy diagrammed in Figure 2-1 (p 17). The table outlines the data sought, informants, data collection/making methods, and analytical methods associated with each of the four research questions, summarising the research strategy. In this section I describe the data sought (Table 2-2 A-D), the data collection and making methods, and the rationale for them. In the next section, Data Analysis (p 27), I describe how the data were analysed to address the research questions.

### *A. Program features and background*

The context of the case study is vital in contextualising and interpreting data gathered about the impact of G4W. This includes the social and ecological features of Knox municipality, the governance of the KES / Knox City partnership, and the intention of founders and coordinators for the G4W program. Learning about the process and features of G4W helped me to identify issues for further exploration, to speak in more detail to informants, and to understand and interpret their responses. The program features and background are also important for assessing the relatability/transferability of the findings to other situations (Blaikie 2010, Bryman 2016). These data were obtained by interviewing two G4W founders and three G4W coordinators, and reviewing program documents provided to me. I asked open-ended questions in interviews with these informants, using prompts related to the history, goals, governance, process and activities of the program, and membership numbers and joining dates. The interview prompts are provided as Appendix 3.

### *B. Impact of program participation – G4W members*

Information about the personal impact of the program on G4W members forms the backbone of the research data. It was used to address all the research questions, from how to engage and sustain residents in wildlife gardening, how a land stewardship ethic and develops, and what the wellbeing impacts are, to what this means for building community capacity to foster native biodiversity and human wellbeing. These data were primarily procured from semi-structured interviews of a diverse sample of G4W members.

**Table 2-2. Data collection/making and analytical methods used to address research questions**

Data Sought	Informants <sup>1</sup>	Data collection/ making method	Analytical method	Research question applied to
<b>A. G4W features &amp; background</b>				
Case study features, procedures, social and ecological context	G4W coordinators (3); founders (2)	Open-ended interviews  Web and document review	Review interviews, material provided  -	1,2,3,4
<b>B. Impact of participation on G4W members</b>				
Attributes of interviewees & their properties	G4W members (16) – diverse sample selected with help of garden assessors	Demographic questionnaire  Observations of gardens, lot size from web	Categorise data	1,2
Impact of G4W on members' gardening purpose and practice, wellbeing and connections with place, nature and community		Semi-structured interviews in members' gardens	Inductive, iterative analysis of interview transcripts using codes derived from participants' responses with assistance of NVivo	1,2,3,4
Wildlife gardening activities of members		Knox City unpublished survey of G4W membership	Quantitative analysis of responses to close-ended questions	1
Usefulness of G4W features; suggestions for improvement			Review responses to open-ended questions, categorise using NVivo	1
<b>C. Impact of G4W program (garden assessor perspective)</b>				
Personal impact of participation in G4W on wellbeing and connections	G4W garden assessors (5)	Open-ended questionnaire	Categorise responses aligned with wellbeing concepts and about connections with place, nature and community	3
Diversity of G4W members; experiences with G4W	G4W garden assessors (13)	Group interview	Review group interview transcript	4
<b>D. Perceived G4W goals and achievements</b>				
incl history, purpose, strategies, social and ecological contributions	G4W founders (2) G4W coordinators (3) KES office-holders (2) Knox managers (3)	Semi-structured interviews	Review interview transcripts, categorise responses with assistance of NVivo software	4

<sup>1</sup>Informant numbers total more than 32 because four informants participated in more than one role

I chose to use a qualitative, interview-based approach for three key reasons. First, exploring people's attitudes, activities and experiences over time is an important way to gain insights into environmental psychology and behaviour (Stokols 1987). Calls for in-depth studies to better understand pro-environmental behaviour and any moderating and mediating factors have continued (Steg and Vlek 2009, Garling 2014). Amongst the factors to be considered are temporal and socio-cultural context, behavioural settings, life domains and situations, and informants' subjective assessments (Stokols 1987, Winkel et al. 2009). Qualitative research using interviews is an approach suited to understanding people's personal perspectives and richly exploring connections between personal and situational factors and behaviour over time (Bryman 2016: 401); more qualitative studies into learning processes and the effects of practising pro-environmental behaviours over time are sought (Chawla and Derr 2012). Second, subjective wellbeing, another key focus of this research, is also highly complex; person-, factor- and context- specific; and subject to variation over time (Kapteyn et al. 2015, Woodhouse et al. 2015). Qualitative, interview-based approaches are recommended for eliciting and understanding personal feelings of wellbeing, particularly in relation to changing circumstances or the occurrence of intervening factors (Milner-Gulland et al. 2014, Woodhouse et al. 2015). Lastly, little is known about wildlife gardening behaviour or the impact of wildlife gardening programs (Nilon 2010, Shaw et al. 2013) while gardening behaviour is known to be complex, idiosyncratic, and influenced by socio-ecological context (Freeman et al. 2012, Cook et al. 2012). Qualitative responses to open-ended interview questions have been found to elicit a finer-grained understanding of how gardening attitudes and behaviour change than pre- and post-intervention evaluation using surveys with Likert scales (van Heezik et al. 2012).

With the time and resource constraints of a PhD study, I sought as diverse a sample of G4W members to interview as possible. This was to allow me to detect whether there might be commonalities in the impact of the G4W program and possible relationships with situational and personal factors of G4W members. Interviews with G4W members were conducted between May and November 2014. I supplemented data obtained through interviews with: a short demographic questionnaire (Appendix 4) distributed to interviewed members in advance of interviews; observations of member's gardens and neighbourhoods at interview; and web and document review (Lorimer 2010a) to obtain the size and proximity of interviewed members' properties to areas of biological significance in Knox.

I also used responses to a G4W member survey, designed and conducted by Knox City in 2009. Although the data were collected at a different time to the interviews, key program features were the same over the period, with the exception of a G4W Facebook page commenced in December 2012. The 2009 survey data did not provide the rich context or detailed stories elicited from the interviews. Instead, survey responses were used to position the interview findings by assessing commonalities

and differences at several reference points. Details are provided in the following section Data Analysis (p 29). The survey contained both closed and open-ended questions, including several about members' wildlife gardening activities and the usefulness of G4W program features (Appendix 5). Ninety-four members responded, representing a 42% response rate. The data included no identifying information so I do not know whether the three interviewees who were in the program at that time participated in the survey.

Below I provide more detail about how the G4W member informants were selected and the interview method.

### Selection of G4W member sample

I sought the assistance of a group of garden assessors to obtain a diverse sample of G4W members to interview. Assessors are Knox City staff or G4W volunteers who visit the gardens of newly joined G4W members and explain the purpose of the program, discussing what members want from their garden and suggesting how they might wildlife garden. A program coordinator invited all 18 garden assessors past and present, living in Melbourne to attend a group interview; thirteen participated. Between them, participant assessors had assessed the gardens of over 200 members. The group was asked to identify all the ways they felt members differed in order to obtain as diverse a sample as possible. They identified a range of personal, property, and program-related aspects of membership diversity (Appendix 6) and separately provided program coordinators with names of 32 potential interviewees who they felt possessed a variety of these characteristics.

Each of the 32 recommended G4W members was sent an invitation to be interviewed by program coordinators, with attached research information and consent sheets (Appendix 1). The invitation included a note that I wished to talk to a variety of members 'from beginner to expert, active to too busy'. Ten invitees (31%) agreed to participate and were interviewed (no follow-up requests were sent).

I subsequently sought additional members to interview. In discussion with program coordinators about how to readily secure a second sample, it was agreed that a coordinator would invite approximately 100 members in the membership database from across each year of joining and a variety of postcodes. Invitations were sent to 106 members. Because a few of the first interviewed informants said that they initially hesitated to participate because they felt their gardens weren't good enough, this invitation included an additional note highlighting that I wished to do more interviews 'from beginner to amateur, inactive or busy, no one or garden is too small or 'not good enough' '. Of the 106 invited members, six responded to the invitation within the first two weeks and were interviewed.



While the number of invited members agreeing to participate indicate strong selection bias for quick response and willingness to be interviewed, the sample was deemed suitable for the purposes of the research because 1) the research was exploratory, identifying concepts for further testing rather than establishing a theory or generalizable findings; 2) the sample included G4W members with diverse backgrounds (Tables 4-1, p50; 5-1, p 69); and 3) data saturation was reached after 16 interviews. Data saturation, “the point in data collection and analysis when new information produces little or no change to the codebook” (Guest, Bunce, & Johnson, 2006: 65), is used to help determine the adequacy of a sample in qualitative studies using non-probabilistic sampling (Bryman, 2016: 417; Guest et al., 2006). In an experiment on data saturation in an interview study, Guest et al. (2006) found that saturation occurred after the first 12 of 60 in-depth interviews, at which point 97% of high-prevalence themes and 88% of all themes identified in the study were recorded (some of which were variants of high-prevalence themes).

### Interview method

Data from members and about their gardens was acquired through a semi-structured interview that included a garden tour. The interview either took place as part of a garden tour or, if in a member’s home, was followed by a garden tour during which the member and I discussed their garden and topics that had arisen during the interview. Interviews were set up in advance by email or telephone and took place either in the home or garden of the member. At the beginning of each interview I reminded the informants that I needed their consent for the interview and gave a brief summary of the goals of my research and what I was interested to hear from them.

The interviews were semi-structured. I used a prompt sheet of questions (Appendix 7) to ensure that I covered the desired points. I did not ask the questions verbatim or in the same order. Often interviewees covered a number of topics in their responses to a prompting question. I sought to elicit from interviewees their gardening and wildlife gardening history; involvement with G4W and use of its features; impact of the program on their gardening plans, skills and activities; their views on wildlife and native wildlife conservation; the outcomes they experienced from wildlife gardening and participation in the program including wellbeing; their feelings of connection with facets of nature and the community; and their willingness to participate in a related citizen science program.

Interview/tours were recorded on a digital recorder and varied in length from 45 minutes to two hours. During the visit I asked for permission and took photographs of particular plants or areas of interest in the garden and around the property. At the end of the interview I thanked the informants, asked whether I might contact them to clarify any questions, and offered to

answer any question they might have for me at a later time. Some of the members, uninvited, subsequently sent me pictures of wildlife in their gardens after my visit or in one case, a video of the family removing weeds. I initially transcribed recordings verbatim into Microsoft Word to understand the process. I subsequently obtained funding and used a transcription service to provide verbatim transcripts. I transcribed the last few interviews when the budget allocation had been met. I reviewed each transcript while listening to the audio recording and corrected any inaccuracies. The 16 G4W member transcripts comprised 492 pages of material.

### *C. Impact of program participation – garden assessors*

In addition to seeking the views of garden assessors on G4W member diversity (described in Section B above, p 24), I sought their opinions about the impact of G4W both broadly and personally as a group of program participants with the specific role of promoting wildlife gardening to joining members by interacting with them in their gardens. In an introductory email and at the beginning of the group interview, I introduced myself and outlined the topics for the interview in a discussion sheet (Appendix 8). These topics were member diversity and their own personal experiences with G4W and wildlife gardening, the reasons they wildlife gardened, why they became assessors, and the rewards and challenges of being involved in G4W. In providing opinions about member diversity, garden assessors also discussed their views of the program and its impact. I recorded the group interview discussion with a digital recorder and transcribed it verbatim into Microsoft Word. The discussion on member diversity took the entire time allotted for the interview. At the end of the interview I therefore asked assessors to please e-mail responses to the open-ended questions about their wildlife gardening experience to the program coordinator. Six assessors provided written responses.

### *D. Perceived G4W goals and achievements*

As the research progressed, it became clearer from my interviews with G4W founders, coordinators and members, and the group interview with garden assessors, how the perceived goals and achievements of the program affected actors' involvement, as well as what the program focused on, how it was delivered, and its impact. To better understand what expectations key managers in Knox City and KES had for the program, what they felt its impact was, and how they assessed this, I interviewed three Knox City managers responsible for its social or environmental portfolios and two KES office-holders. I asked them about their views on G4W, its purpose, its strategies, and the actual and potential contributions of G4W to their organisation's social and ecological goals. These data helped to address the question of how G4W strengthens Knox City's capacity to foster its native biodiversity and wellbeing. The interviews took between one and two hours and I digitally recorded and transcribed them verbatim into Microsoft Word.

## Data analysis

In this section I describe the analytical methods used to generate findings from the data for each of the research questions addressed. Figure 2-1 (p 17) and Table 2-2 (p 22), in diagrammatic and tabular format respectively, may be referred to as an outline for this discussion.

### *Question 1 - How does the program engage and sustain residents to wildlife garden to conserve municipal native biodiversity?*

To develop findings for research question 1, I first analysed data from the G4W member transcripts using an inductive, iterative analytic approach, assisted by the use of NVivo software (explained shortly). I then used an Excel spreadsheet to compare findings from the member interview analysis with the demographic data in the questionnaires and the property data collected by web and document (Lorimer 2010a) review. I also positioned findings from the interview data by assessing commonalities and differences between the interview data and data from an unpublished 2009 Knox City survey of the G4W membership at several reference points. Details of these analytical methods are set out below. My findings are presented in Chapter 4.

#### **Analysis of G4W member interview data**

I interpreted the data in G4W member interview transcripts seeking to address the underpinning question ‘What’s happening here?’ (Thornberg and Charmaz 2011: 43), to explore the process from the layperson’s point of view to derive insights for further investigation and testing (Layder 1998, Moses and Knutsen 2007, Corbin and Strauss 2008). I used an approach similar to that of grounded theory, sometimes called a generic inductive qualitative model (Hood 2007) or generic inductive approach (Thomas 2006). Like the grounded theory approach (Charmaz 2014) it includes: a descriptive process-oriented question, purposeful sampling, collecting and analysing data simultaneously in an iterative process, initially coding narratives of members line-by-line, and using emergent ideas and relationships from the initial coding to develop analytical categories and codes. Where my approach differs from grounded theory is 1) in ending data collection at data saturation (when new data added little change to code categories and fit within the emergent conceptual framework) but *not to theoretical saturation*; and 2) developing and focusing the design during the research process to interpret data and to conceptualise relationships between program features and their impact on participants, but *not to provide a tested explication of a process* (Thomas 2006, Hood 2007, Charmaz 2014).

I used the QSR NVivo for Mac software program to code the transcripts line by line. As described above, I did not establish codes or categories on the basis of pre-determined hypotheses, factors, or frameworks relating to gardening practices or promoting pro-environmental behaviour. I coded according to topical narrative provided by the informant

(Thomas 2006, Richards and Morse 2013), for example if someone spoke about removing weeds, I set up a coding node called 'Removing weeds' and put the coded narrative segment into it. I coded enough narrative about a topic to provide a context for the coded text. Informants often covered more than one topic in a response to a prompt or even in a single statement. I coded the same narrative to as many different topics as were relevant; topics were coded with contextual segments relevant to that topic.

As I continued to code members' transcripts sequentially, I reviewed previous nodes and transcripts, and iteratively set up 'mother' nodes into which these nodes could be grouped or merged. The NVivo program made it easy to locate and review all coded text segments grouped in a node within their respective transcripts, as well as to review how each element of text within a manuscript was coded. My coding followed a fluid process as described by (Thomas 2006, Richards and Morse 2013), in which successive coding decisions are informed by previous ones and the coder's interpretation of them. Mother nodes included nodes relating to attitudes, feelings and meanings; impacts of G4W program features; gardening activities, purpose, motivations, rewards and challenges; and connections with nature, place and community. I paid particular attention to how and why these elements changed from the time prior to an interviewee joining the program and subsequently, up until the interview. The mother nodes were grouped into five master categories:

**Gardening Journey** (containing 15 mother nodes relating to the period *prior to* commencing wildlife gardening activities);

**Wildlife Gardening Journey** (containing 16 mother nodes relating to the period after joining the program and commencing wildlife gardening activities);

**G4W Program** (containing 14 mother nodes relating to members' interaction and opinions about the program from before to after joining);

**Feelings/Connections for** (containing 12 mother nodes relating to members' expressions of wellbeing or connections with various aspects of nature, community, or place);

**Conservation of Native Plants/Animals** (containing 7 mother nodes relating to members' opinions about this subject);

**Citizen Science Participation** (a single node containing members' responses to a question asking about their willingness to get involved in such a program).

I wrote memos throughout the coding and analytical process about patterns that were emerging and referred to them for interpreting the data and findings.

### Comparison of interview, demographic, and property data

I transferred four types of data into an Excel spreadsheet: 1) data from the members' demographic questionnaires (Appendix 4); 2) coded data from the interview transcripts; and 3) lot size and location data for each interviewed member, obtained from web and document (Lorimer 2010a) review. Each spreadsheet row contained data for a single member and I set up sortable columns for different data categories. Some of the columns contained numerical data (for example age, postcode, and property size columns). Some contained textual data (for example, High School, Tertiary, for an education column). Data derived from interview coding nodes was reduced to a brief summary before being put into columns. Columns were then grouped next to each other by common topic, for example, under the topic 'Motivation for Joining' were columns 'Support Wildlife', 'Get Advice', 'Save Environment', 'Free Plants', and 'Grant'. In each cell in this type of column, I either put a tick for yes or left blank for no according to an interviewee's response (refer Table 4-3 page 53 for an example). The spreadsheet allowed me to selectively sort columns and detect if there were patterns between features of members' personal backgrounds and property size or location and their interaction with G4W. For example, I found that those members with previous experience planting native species to attract wildlife gave this as a reason for joining G4W. On the other hand, only a few of the members without this gardening experience joined for this reason; all of these had been excited by encountering native wildlife in the neighbourhood and were looking for information on how to support them in their gardens. The patterns that emerged were not important numerically (in terms of statistical generalisation), but rather in whether they displayed relationships between factors and behaviours that merit further exploration.

### Positioning interview findings in relation to G4W member survey data

I compared interview findings to responses from the 2009 Knox City survey for any commonalities or notable differences at several reference points. One group of reference points involved survey responses to closed questions about whether respondents had planted indigenous species or removed environmental weeds, and whether the garden assessment was useful. The other group involved survey responses to the open-ended questions: 'garden assessment comments', 'what has been the most useful part of the program', 'what has been the least useful', 'can you suggest any further improvements for the program' and 'further comments'. To facilitate this comparison, responses to the open-ended survey questions were coded in NVivo for Mac. Coded segments were placed in one or more relevant topical categories. This simple categorisation facilitated a high-level review of the range of topics covered by survey respondents and ready reference to detailed comments in each topic area. My findings are discussed in Chapter 4.

*Question 2 - Do participating residents develop a land stewardship ethic and practice, and if so how?*

As I iteratively analysed the G4W member interview data as described above, I found that a conceptual model was emerging for how wildlife gardening can develop into a land stewardship practice. I refined my second research question to focus on this concept, an acknowledged step in the conceptual phase of inductive qualitative research (Hood 2007: 156, Bryman 2016: 379). I use the term conceptual model to mean ‘the patterns in the data in a simplified form’ as described by Blaikie (2010, p 21), or similarly, a concept in the way Corbin and Strauss define developing concepts as part of an ongoing analytical process: ‘Concepts provide ways of talking about and arriving at shared understandings among professionals’ (Corbin & Strauss, 2008: 8) that are ‘reevaluated and adjusted to meet the situation at hand’ (Corbin & Strauss, 2008: 12) by practitioners.

To understand the development of land stewardship, I considered how interviewed G4W member descriptions of the materials, purpose, meanings and connections associated with their gardening aligned with those of land stewardship and how they evolved. Other qualitative studies have used purpose, meanings, and activities to evaluate the development of pro-environmental behaviour by individuals, although in the context of waste and energy reduction (Hargreaves 2011) and climate change campaigning (Hards 2011). I prepared an initial model of a process for the development of land stewardship and the role of program elements. I then re-examined the manuscripts and coded material on a participant-by-participant basis to refine the model.

I do not use the term ‘theory’ for my conceptual model because it is early in its development and has not been tested, for example through theoretical sampling, applying it to interpret findings in other programs, or developing survey tools to test some of the posited relationships in the broader program population. My findings are discussed in Chapter 5.

*Question 3 - What are the impacts of participation in the program on participants’ wellbeing and connections with place, nature, and community?*

To analyse data and develop findings for research question 3, I used two sources of data. The first was the responses of G4W members in the semi-structured interviews. These interviews included prompts about wellbeing and feelings of connection with one’s garden, nature, and community (refer items 12, 13, 17 Appendix 7). The second data set was the responses of garden assessors to an open-ended questionnaire about the motivations, challenges and rewards of wildlife gardening, assessing G4W members’ gardens, and participating in the G4W program (Appendix 8, item 2).

I wished to understand, in the words of G4W member and garden assessors, the qualities of and basis for their feelings of wellbeing in relation to G4W participation. Subjective components of wellbeing include being happy or satisfied with aspects of life including social connections, being

happy/content in relation to various life experiences, and having feelings of personal growth or purpose (Dolan et al. 2011, Taylor 2015). Interview responses of G4W members and responses from garden assessors were coded line by line using NVivo software. Any narrative referring to a 'reward', or including words like 'passion', 'enjoyment', 'learning', 'connecting', 'sharing', 'joy', 'satisfaction', 'hope', 'positive feedback', and 'achievement', or, in the case of G4W members, provided in response to wellbeing or connectedness prompts, was collated and used as wellbeing findings. Although interview prompts about wellbeing and connection generated rich data, expressions of wellbeing and connectedness emerged throughout members' interviews, particularly in their descriptions of the purpose and motivations for their wildlife gardening, and the rewards, setbacks, and challenges. My findings are discussed in Chapter 6.

#### *Question 4 – How does the program strengthen its community's capacity to foster its native biodiversity and wellbeing?*

My rationale for using community capacity to assess the G4W program's social and ecological impacts is explained in the Introduction of this thesis, in brief that while community capacity to address biodiversity conservation and wellbeing challenges is critical for long term success, it is undervalued, under-assessed, and under-reported in the development or assessment of conservation programs. I aspired to develop a community capacity assessment framework which can focus attention on how a conservation program is improving a community's ability to address its biodiversity conservation and wellbeing issues in an integrated way, ability that can be deployed and shifted in response to changes in the operating circumstances, as commonly occurs in the urban landscape. In Chapter 7 I describe the background and construction of the framework.

I mapped data and findings from the first three research questions, supplemented by data provided in interviews of Knox City managers and KES officers, onto the community capacity building framework. I used the findings to consider how the G4W program strengthens the Knox community's capacity to foster both its native biodiversity and human wellbeing, and to identify elements of success and areas for improvement from a socio-ecological perspective. I also assessed the benefits of using the framework for these purposes. Findings are described in Chapter 7.

## Quality

This research is qualitative and in terms of my knowledge assumptions outlined above, in the belief that a second researcher may not get the same answers to the questions asked because the particular time and setting in which the interview occurred cannot be replicated, nor can the unique interaction between the informant and the researcher, all of which influence what emerges as data (Blaikie 2010: 271, Bryman 2016: 398). Similarly, each researcher may code or interpret the data somewhat differently. This makes it inappropriate to use replication (Blaikie 2010: 271; Sandelowski

1993 as quoted in Rolfe, 2006: 305) or an inter-rater reliability check for coding consistency (Morse 1997) to assess the ‘validity’ and ‘reliability’ of this research. It has been proposed that other quality criteria be applied to qualitative research (Rolfe 2006, Blaikie 2010, Bryman 2016). Below I outline several of these proposed criteria and how this research addresses them.

### Credibility

This criterion relates to the ‘feasibility or credibility of the account that the researcher arrives at’, and may be pursued through getting feedback from participants about the validity of the researcher’s transcripts, reports or feedback to them; another method is triangulation, that is using more than one method or source of data to obtain or assess findings (Bryman 2016: 384-386). In terms of impacts of G4W on members I sought to assess the credibility of my findings in four ways. First, I discussed my findings with G4W project coordinators (from KES and Knox City) as research progressed. Two of these people had been with the program since its inception. My findings align with their experience and understanding of the program’s impacts on participants. Second, I provided a high-level summary of my findings about key features of the program and its wellbeing impacts to the G4W membership at a G4W social event (in October 2015). I asked attendees to meet with me over the evening to discuss their own experiences or alternative views. Approximately 80 people attended; six participants involved in the research met with me to convey interest and affirmation of my findings and two members who I had not spoken to provided in-depth stories of their own experiences which corroborated my findings about the wellbeing impacts of G4W involvement. Third, I asked a program coordinator to organise a get-together of all research participants to hear findings from my research (in May 2016). Unfortunately only six participants attended; there was interest and affirmation from those who came. Lastly, as described in the analytical methods for Research question 1 (p 29), I compare the interview findings with G4W membership survey data at several reference points.

### Relatability/transferability

This criterion relates to providing a rich account of the case study such that other researchers or practitioners can evaluate and adapt the findings to their needs (Bassey 1981, Bryman 2016: 384). I have attempted to do so in this thesis and have provided a description of Knox Gardens for Wildlife in Chapter 3 to assist with this purpose.

### Dependability and confirmability

Dependability entails keeping complete records of all elements of the research process for peer auditing either during the research or subsequently to determine whether procedures were appropriate and carried out as described, and how well findings (particularly inferential ones) can be justified (Bryman 2016: 384-386). Confirmability relates to auditing that the researcher has acted in



good faith and not ‘overtly allowed personal values or theoretical inclinations manifestly to sway the conduct of the research and findings deriving from it’ (Bryman 2016: 386), that is, a means of auditing the criterion of ‘integrity’ (Whittemore et al. 2001: 531). A downside of this type of auditing is its cost in time and resources and limited availability of suitable auditors (Bryman 2016: 386). I will keep records of all substantive elements of my research for five years as required by my Ethics application, in particular audio recordings and transcriptions of interviews, my coding and memos in NVivo software, demographic and environmental data, and the analytical data spreadsheet. These, in conjunction with the thesis, can be audited.

## Relevance

The purpose of this research is to generate useful insights for urban communities to foster their native biodiversity and wellbeing by involving residents through their gardening. Findings from this research have been used to successfully secure funding from a Victorian state agency for a pilot program to assist local government-community group partnerships to implement and test urban wildlife gardening programs, adapting apparently successful features to their circumstances. There continues to be interest, with over a dozen Victorian urban municipalities and community groups participating at the time of writing.

## Comments on scope and generalisation

The time constraints of the PhD restricted the scope of my research to an exploratory qualitative study focusing primarily on the impact of a case study program on a small sample of participants. It is unavoidable with my sampling methodology that the interviewed G4W members will have ‘self-selected’ themselves for participation. All 32 informants were interested in wildlife gardening (for different reasons and in different ways) when interviewed. While they had many positive comments to make, they also had many suggestions for improvement, not only in the program, but also in Knox City (and other community member)’s support for the environment. I was not able to further test my findings about the importance or impact of key G4W program features with the broader G4W membership as I had originally hoped to do (although the latter has subsequently occurred). I was also not able to develop or test the conceptual model of stewardship development further, for example using a grounded theory approach.

My research approach does not allow generalisation, or the direct transference of the findings, to other people or groups. The findings do however show that: the program engages urban residents to garden to conserve municipal biodiversity and what the instrumental program features are; private land stewardship values and practice develop; participation generates feelings of wellbeing and strengthened connections to nature and community; and community capacity to foster both biodiversity and wellbeing is improved through this approach. The findings may be further tested

and investigated; I recommend areas for further research in Chapter 8. Practitioners may apply the findings and conceptual models developed here to relatable cases (Bassey 1981, Corbin and Strauss 2008, Blaikie 2010). In Chapter 3 I describe features of the case study that should be considered in assessing its relatability or transferability to other settings, including G4W governance and process, demographic and ecological characteristics of Knox City, and its pattern of urban gardening and garden character, similar to that found in areas of the United States, Australia, Canada and New Zealand (Ignatieva and Stewart 2009).

## 3 KNOX GARDENS FOR WILDLIFE

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*It takes time...But by understanding the land on which we live and by caring for it we can choose between just having a place to live or belonging to a living home.*

Baker 2004, Author's note

### Introduction

In Chapter 1 I set the context and describe the purpose of this research, overview the research approach and explained the thesis structure. In Chapter 2 I described the research design and its rationale in detail. In this Chapter I describe features of the case study that assist with assessing its relatability to other settings, including the demographic and ecological characteristics of Knox City municipality, the conservation objectives of Knox City and KES, and the G4W program governance and processes. I close with an introduction to the ensuing four chapters that report the findings of the research.

### Knox City Municipality

Knox City is one of 31 local government areas in greater metropolitan Melbourne (Fig 3-1, p 36). It is located in the outer eastern metropolitan of Melbourne, approximately 25 kms from the Melbourne GPO. It covers 114 square kilometres, and has just over 154,000 residents and 58,000 homes in eleven postcode localities (Knox City Council 2016a).

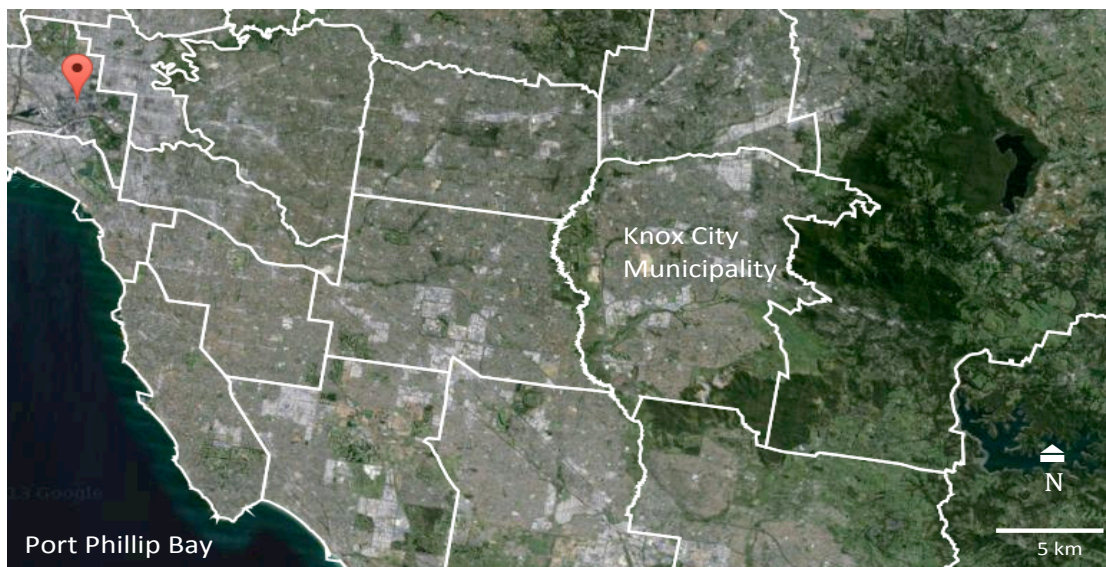
**Figure 3-1. Map of greater metropolitan Melbourne local government authorities (Knox city starred)**

From: [www.eduweb.vic.gov.au/edulibrary/public/beststart/bs\\_atlasmaps2nd.pdf](http://www.eduweb.vic.gov.au/edulibrary/public/beststart/bs_atlasmaps2nd.pdf)



The municipality borders national parks on its eastern and southern boundaries (dark green patches in Figure 3-2 below).

**Figure 3-2. Map of Knox City municipality. Red balloon marks City of Melbourne GPO**



Over the last 30 years the municipality has gone through a period of rapid housing and business development. It is now in a time of maturation and consolidation (Knox City Council 2016b), although there are areas nominated for residential growth (Knox City Council 2015a).

### Demographic characteristics

Selected demographic information for Knox City and comparators for Greater Melbourne and Australia are shown in Table 3-1, p 38 (.id 2016). Knox City has a similar socio-demographic profile to the Australian population as a whole but with more couples with children and residents living in separate houses – italicised in Table 3-1.

The very high proportion of Knox residents who live in separate homes that they are purchasing or fully own (italicised in Table 3-1) would appear to favour the ability of residents to choose to participate in wildlife gardening programs. Approximately 85% of households in Melbourne have gardens, ranging from 53% in the Inner Melbourne statistical region to 93% in the Outer Eastern statistical region, in which Knox City is located (Australian Bureau of Statistics 2012). The municipality has a high proportion of families with children. The relative disadvantage score (SEIFA –Table 3-1 footnote) shows that by mean score, the municipality ranks better than the mean for Australia and greater Melbourne, although there is variation at smaller area scale. There do not appear to be significant socio-economic constraints on residents’ ability to participate in wildlife gardening.

**Table 3-1. Selected demographic characteristics of Knox City, Greater Melbourne, and Australia**

2011	City of Knox	Greater Melbourne	Australia
<b>Housing</b>			
<i>Purchasing or Fully Own Home</i>	78%	67%	64%
Renting	17%	27%	29%
<i>Live in Separate House</i>	87%	71%	74%
Live in Medium Density Dwelling	13%	21%	17%
Live in High Density Dwelling	1%	7%	8%
<b>Highest Educational Qualification</b>			
Bachelor's degree or higher	18%	24%	19%
Advanced Diploma	9%	9%	8%
Vocational Qualification	20%	15%	18%
Year 12 or more	50%	55%	48%
Less Than Year 12	44%	36%	43%
<b>Age / Life Stage</b>			
Median age	38	36	37
Couples w/children	40%	34%	31%
Young workforce (25-34)	13%	15%	14%
Parents & homebuilders (35-49)	22%	22%	21%
Older workers & pre-retirees (50-59)	14%	12%	13%
Empty nesters & retirees (60-69)	10%	9%	10%
Seniors (70-84)	7%	7%	8%
Elderly aged (85 and over)	2%	2%	2%
<b>Birthplace</b>			
Australia Born	69%	63%	70%
Overseas Born – English Speaking	8%	7%	9%
Overseas Born – Non English Speaking	20%	24%	16%
<b>Index of Relative Socio-Economic Disadvantage (SEIFA*)</b>			
SEIFA score	1001.3 to 1102.2 Span across 11 postcodes	1020.3	1002.0

\* SEIFA Index of Disadvantage measures the relative level of socio-economic disadvantage based on a range of Census characteristics including low income, low educational attainment, high unemployment, and jobs in relatively unskilled occupations. A higher score on the index means a *lower* level of disadvantage (<http://profile.id.com.au/knox/seifa-disadvantage>).

## Ecological characteristics

Australia has a high proportion of endemic species, with far more endemic terrestrial vertebrates than any other country; 45 to 90 per cent of Australian floral and faunal groups (depending on which one) are found nowhere else in the world (Possingham 2008). There is a high proportion of native biodiversity in Australian urban areas (Ives et al. 2016), including Knox City. Nonetheless much of greater Melbourne, including Knox municipality, displays a pattern of urban gardening and garden character that is comparable to other Anglo colonial cities in North America and Australasia (Ignatieva and Stewart 2009).

Knox municipality prides itself on its 'leafy green' aspect (Knox City Council 2016c); twenty four per cent (24%) of its land area is covered by tree canopy (Jacobs et al. 2014). The dominant native vegetation class of Knox is eucalypt forest with an open canopy and dense understorey, and scrub bushland (Knox City Council 2015b). A study of the sites of biological significance in Knox used field surveys (or, in a few cases, extrapolated from a representative sample of inspected patches using aerial photographs and maps) to assess and map "every accessible area of natural or semi-natural habitat larger than the size of a typical house allotment" (Lorimer 2010b). This study found that there were 118 sites of biological significance, 76 of state-wide biological significance and one of national biological significance. Significance is commonly due to the presence of a vegetation type or class officially listed as endangered (in this case Valley Heathy Forest and Swampy Woodland). Eighty four per cent of indigenous plant species are locally threatened, with 41% critically so. While all of the threatened ecological vegetation habitats are represented in reserves managed for conservation, threatened plant species are also found on publicly owned sites including schools, roadsides, utility installations and freeway reservations, and on private residential land. A significant proportion of the fauna species found in Knox are listed as threatened or near-threatened in Victoria. At the time of the study, a recent decline in native vegetation was attributed to drought, construction and widening of main roads, clearing for land development and quarrying (Lorimer 2010b).

## Knox City biodiversity strategies

Knox City's goal for biodiversity is to improve the biodiversity and health of Knox ecosystems (Knox City Council 2008). Current strategies include management and enhancement of bushland reserves, putting indigenous plantings in parkland, in and around wetlands, selected roadsides and other public spaces, increasing the network of indigenous vegetation habitat corridors and waterways including bush boulevards, putting regulatory overlays in place that support the quality of biologically significant sites, and supporting community participation in bushland reserve management and habitat retention and improvement on private residential land through programs like Gardens for Wildlife and Biodiversity Buddies (Knox City Council 2013).

## Knox Environment Society

The Knox Environment Society (KES) was founded over 30 years ago in 1982 by a ‘small group of likeminded people interested in their local environment and community’ (Knox Environment Society 2015a), with objectives to:

Foster within the community an interest in the Knox environment;

Provide opportunities for local environmentalists to meet and exchange ideas;

Undertake such projects, studies and activities as will further the interests of conservation and natural history (Knox Environment Society n.d.).

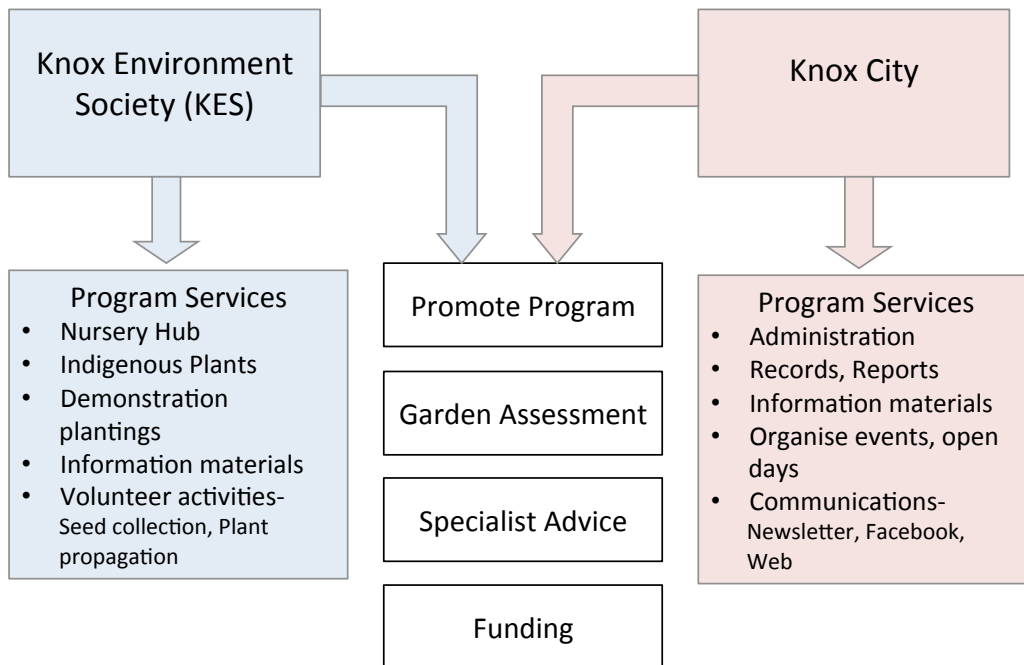
In addition to subscription membership, KES manages a group of 50 volunteers. The volunteers are principally involved in collecting seed of and propagating locally indigenous plants, and running an indigenous community plant nursery for the primary purpose of providing Knox residents with material for their gardens. KES also runs an environmental consultancy and wholesale plant nursery, providing indigenous plants of known provenance to the State parks department, local governments, and commercial native plant nurseries. In 2009 the community nursery moved to a publicly prominent reserve (Ferntree Gully Recreation Reserve) behind the local library. Most of the funds raised by KES go ‘back into the community for environmental projects, both locally and globally, such as the Sword-grass Brown Butterfly project’ (Knox Environment Society 2015a) This project, initiated in 1993 with Knox City, involves promoting the planting of indigenous Saw-sedges (*Gahnia sieberiana*) in selected Knox City reserves, school grounds and residential gardens to link essential larval food habitat for the locally threatened Sword-grass Brown Butterfly (*Tisiphone abeona*) (Knox Environment Society 2015b). I was informed that the project was a conceptual precursor for the Gardens for Wildlife program.

## Gardens for Wildlife governance

The Gardens for Wildlife program is run through an informal collaboration between Knox City and Knox Environment Society. Figure 3-3 (p 41) shows key program services provided by either or both organisations. Responsibility for administrative coordination of the G4W program lies with the Knox City Biodiversity Coordinator, head of the Biodiversity team. This group sits within the Engineering and Infrastructure Department of Knox City, one of four departments in the organisation.



Figure 3-3. Gardens for Wildlife program services



Separate services from Knox Environment Society and Knox City (shaded boxes) and joint contributions (unshaded boxes)

## Gardens for Wildlife membership process

Any resident or employee of Knox municipality can sign up to the Gardens for Wildlife program either on-line or posting in a form. When a participant signs up the following steps take place:

He/she is sent an introductory newsletter and information CD;

A program staff member (Knox City) arranges a garden assessment. Assessors (usually one Council staff and one volunteer) walk the garden with the participant, explaining the purpose of the program, identifying the garden’s environmental weeds and indigenous flora and fauna, discussing what participants want from their garden, suggesting opportunities to wildlife garden, and answering participant queries;

An assessment pack is sent to the participant. This includes a follow-up assessment report, illustrated with colour photos, that provides general advice on selecting and planting indigenous species and providing habitat for native wildlife, as well as specific suggestions discussed on the visit, usually about control of weeds and possible indigenous replacements, handling garden elements like fencelines and screening using wildlife gardening techniques, and methods for attracting specific types of native wildlife. Gardens are given a category ‘score’ related to presence of wildlife habitat features in the garden, ranging from 1 (most) to 5 (least). Other materials

provided in the assessment pack are a certificate, letterbox plaque, G4W booklet, brochures, flyers, and an information CD about Knox indigenous plants and their use in gardens.

## Preamble to data chapters (Chapters 4-7)

This chapter and the two before it have described the research questions, methodology, and context for this study. The ensuing four chapters provide the research findings, sequentially answering each of the four research questions set out in the Introduction (Table 1-1, p 10). The chapters are in the form of self-contained papers, each with its own abstract, introduction, methods, findings, and conclusion. Three of these papers have been submitted for publication, with one (Chapter 4) in press. The abstract of each chapter summarises the context and importance of the research question it covers, as well as the key findings and their implication. Each refers to and discusses different literature pertaining to each chapter's specific research topic. Unavoidably there is some repetition, particularly in the description of methods and common background. I have used the same pseudonymic initials (I1 to I16) for quotes of interviewed G4W members in Chapters 4 and 5, where they are referenced to tables illustrating different relationships between interviewee attributes, motivations, gardening experience, and activities. The numeric designation came from the interviewee order used in the first such table in the thesis, Table 4-2 Chapter 4 (p 52). For other quotes and in Chapters 6 and 7 I have simply referred to the role of the informant.

## 4 WILDLIFE GARDENING FOR COLLABORATIVE PUBLIC-PRIVATE BIODIVERSITY CONSERVATION

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*And that's part of the process...seeing things grow, seeing what doesn't work, what does work...and staying in touch with people like KES and Knox Council all the time.*

Gardens for Wildlife Member, 2014

### Abstract

Complementary public and private conservation action is required to sustain native biodiversity in cities. Residents can contribute by wildlife gardening - removing environmental weeds, cultivating indigenous flora, and improving habitat in their gardens. There is currently little guidance about how best to involve residents in wildlife gardening and align their work with public land management. I explored how a purposively chosen wildlife gardening program in Melbourne, Australia engaged and supported residents to augment local government efforts to conserve indigenous biota. Sixteen semi-structured interviews were conducted with program members to understand the program's impact on their gardening and their connections with their council and community. Unpublished Council survey data were used to position interview findings on wildlife gardening activities and the value of program features. Interviewees detailed how they modified their gardening to assist their council to conserve indigenous biota. Five program features were implicated in this change: 1) on-site garden assessment; 2) indigenous community nursery; 3) locally sited communication hubs; 4) a framework that fosters experiential learning and community linkages; and 5) endorsement of each garden's potential conservation contribution. Collaborative wildlife gardening programs can engage residents to manage their land to achieve landscape-focused conservation goals while building relationships with council and community.

### Introduction

As cities continue to grow exponentially, disrupting the native ecosystems in and around them (Lambin et al. 2001), there have been calls to develop the motivation and skills of urban residents to care for biodiversity (Secretariat of the Convention on Biological Diversity 2012). Engagement of this sort can lead to political and financial support (Dunn et al. 2006), conservation volunteering (Schwartz 2006), and improving habitat for native species on one's own land (Goddard et al. 2010b). A comprehensive review of the urban conservation literature concluded that more research is needed about how to use urban green spaces, including gardens, to conserve biodiversity, and how to foster conservation behaviour by residents (Shwartz et al. 2014).

In cities, multiple strategies are needed for biodiversity conservation, including maintaining habitat patches and buffers, developing corridors and stepping stones, and improving the habitat quality of the matrix (Kowarik 2011, Threlfall et al. 2016). Complementary activities are required by public and private landholders (White et al. 2009, McCaffrey and Mannan 2012). Local governments can protect and enhance native habitat on public land (Standish et al. 2013) and improve connectivity between these spaces (Rudd et al. 2002), including along streams and roadsides (van der Ree 2009, Ikin et al. 2013). Residents can augment these efforts, improving the landscape matrix by providing habitat for native species in their gardens, known as wildlife, habitat, or ecological gardening (Goddard et al. 2010b, Lindemann-Matthies and Marty 2013).

Wildlife gardening activities include removing environmental weeds (Smith et al. 2006), adding habitat features such as shelter or nesting sites and planting indigenous flora (Goddard et al. 2010b), nurturing indigenous regrowth (Doody et al. 2009), and sometimes feeding birds (Goddard et al. 2013) although this practice can be detrimental to native species (Galbraith et al. 2015). The potential of wildlife gardening to improve habitat for native species is substantial (Goddard et al. 2010b), as residential gardens comprise a sizable proportion of land in many cities (Davies et al. 2009), and gardening is an activity that many diverse residents undertake. Maximising this potential requires engaging residents to wildlife garden, and aligning these practices with public conservation land management (Goddard et al. 2010b).

There has been little empirical investigation of how to foster wildlife gardening effectively, or how to do so in a way that aligns this work with public land management. The aim of this study was to investigate how a purposively selected wildlife gardening program engaged and supported residents to augment Council efforts to conserve indigenous biota across the municipal landscape. I begin with a brief review of what is known about initiating and supporting wildlife gardening, and harnessing its potential for conservation.

### Engaging and supporting urban residents to garden for wildlife

Little is known about the motivations for wildlife gardening (Goddard et al. 2013). Plant selection and husbandry are influenced by availability (Smith et al. 2006), aesthetics, functionality, ease of maintenance, attraction to wildlife, native-ness (Kendal et al. 2012, Uren et al. 2015), and a gardener's knowledge and experience with plants (Power 2005). Some of these factors (e.g. particular aesthetics) could hinder uptake of wildlife gardening while others (e.g. wanting to attract wildlife) could facilitate its uptake (Clayton 2007). The reported rewards of observing wildlife and taking care of living things (Clayton 2007, Freeman et al. 2012), including local wildlife (Bernardini and Irvine 2007), could stimulate and reinforce wildlife gardening practices. Indeed, a study of British wildlife

gardeners found that attracting or interacting with wildlife, particularly birds, was a key motivator (Goddard et al. 2013).

It has been postulated that pro-environmental behaviour derives from feelings of personal connection to and caring about nature (Nisbet et al. 2009), generated from interacting with local nature (Pyle 2003, Chawla and Cushing 2007). Although appreciation for nature is a strong motivator for gardening (Clayton 2007), a strong sense of connectedness to nature (measured using a closed-question scale) is not required to engage in wildlife gardening (Shaw et al. 2013). Studies using closed-question scales have shown that having pro-environmental values does not predict wildlife gardening (Goddard et al. 2013) or correlate strongly with ecologically sustainable gardening practices (Larson et al. 2010). These results are ascribed to mediating factors such as social norms, pre-existing yard structure, and other motivations (Larson et al. 2010, Cook et al. 2012). Clayton (2007) suggested that it is because ‘the garden seems to be seen as part of the domestic world ... rather than as part of wild nature’ (Clayton 2007: 223), aligning with Bhatti and Church’s (2004: 45) finding that gardens are valued most for making ‘a house a home’, and least for ‘where you can care for the planet’.

Although many organisations in the UK, North America, Europe and Australia promote wildlife gardening, little is understood of their effectiveness in engaging or sustaining people to do so (Nilon 2010, Shaw et al. 2013). Few studies have explored interventions that initiate wildlife gardening. Van Heezik et al. (2012) found that providing information to householders about native wildlife in their gardens while conducting biodiversity inventories there prompted some to wildlife garden. Evans et al. (2005) and Cosquer et al. (2012) reported that some citizen science participants began gardening to foster the wildlife they were monitoring in their gardens. With so little investigated about initiating and supporting wildlife gardening, a nuanced exploration of how a program successfully engages and supports residents to remain involved in wildlife gardening is a core objective of this study.

### Integrating wildlife gardening into landscape scale conservation

Effectively conserving species across urban landscapes requires action from a diversity of actors, including individuals and public bodies, with networks linking their activities (Ernstson et al. 2010). Suggestions have been made to increase and aggregate wildlife gardens using either ‘top down’ regulation or financial incentives (Kirkpatrick et al. 2009), home-owner associations (Lerman et al. 2012), and community or non-governmental organisation-driven initiatives (Goddard et al. 2010b). I wished to explore not only how a program can engage residents to wildlife garden, but also to do so in order to assist council as a form of public-private conservation land management.

## Methods

I chose Knox City's Gardens for Wildlife (G4W) program (Knox City Council 2016d) as a 'revelatory' case study (Yin 2009: 48-49), one that provided an opportunity to explore the dynamics of a collaborative wildlife gardening program in real life. My primary data, obtained in 2014, came from semi-structured interviews of 16 G4W members. This study received ethics approval from a sub-committee of the RMIT University Human Research Ethics Committee.

### Case study program

The Knox G4W program is located in outer eastern Melbourne. It is a collaboration between a community group – Knox Environment Society (KES) – and an urban council (Knox City Council) that promotes wildlife gardening (in this case removing environmental weeds, planting and protecting indigenous vegetation and vegetative structure, and providing habitat for indigenous wildlife) to help conserve the municipality's indigenous biodiversity (Knox City Council and Knox Environment Society 2008). KES promotes the local environment and runs an indigenous plant nursery that is a key feature of the program. Begun in 2006, G4W has been expanding, with no advertising investment, at between 50-70 new members a year since 2009 and currently has a membership of over 600 households. Knox City has a high proportion of indigenous species (Lorimer 2010b) and garden character similar to Anglo colonial cities in North America and Australasia (Ignatieva and Stewart 2009).

G4W members are residents of Knox City who join G4W by signing up online or by post. Members receive an on-site garden visit by garden assessors who explain the program's purpose, identify environmental weeds and indigenous biota in the garden, and describe specific opportunities for wildlife gardening. Members then receive an illustrated assessment report, a Gardens for Wildlife booklet (Knox City Council and Knox Environment Society 2008), and free vouchers for 20 KES nursery plants. Members whose property is deemed by Council staff to contain habitat of sufficient quality and proximity to a conservation-significant site are invited to apply for a grant for their wildlife gardening activities (entailing an initial on-site planning visit and a post-completion review). Three to six newsletters are sent to members and posted on Council's website each year. Members also receive invitations to 3-4 program events that vary year to year, e.g. wildlife information sessions, open-garden days and visits to local reserves. In December 2012 G4W started a Facebook page to enable and stimulate members to communicate with and support each other virtually. Members can request advice or subsequent garden assessments from Council.

## Sampling strategy

I sought to qualitatively explore, in depth, the impact of the program on a heterogeneous sample of G4W members, rather than to quantitatively assess a representative sample of G4W members. I obtained the assistance of 13 garden assessors (Council staff and G4W volunteers), who between them had visited over 200 members' gardens. In a group interview these assessors identified different membership attributes based on their interactions with members, and then independently suggested potential interviewees they felt demonstrated a variety of these characteristics. All 32 members suggested were invited to participate; 10 responded and were interviewed. Subsequently the program coordinator invited 106 members on the membership database from across joining years and postcodes; six of these responded and were interviewed. While this indicates strong selection bias for members willing to be interviewed, the sample was deemed suitable for the exploratory purposes of the research because 1) the sample was diverse (Tables 4-1 p 50 and 4-2 p 52), and 2) saturation, as described by Guest et al. (2006: 65) as 'the point in data collection and analysis when new information produces little or no change to the codebook', was reached after 16 interviews in the data analysis stage (refer Methodology, first paragraph, p 25).

## Data acquisition

Data from interviewees and about their gardens was acquired through: 1) a short demographic questionnaire; 2) semi-structured interviews at interviewees' homes that included a walking tour of their gardens; 3) observations of the garden at interview; and 4) web and document review (Lorimer 2010b) to obtain property size and proximity to parks and reserves. The demographic questionnaire was distributed to interviewees in advance and collected at the interviews. It contained questions including interviewees' gender, age, employment status, qualifications, birth country, postcode, and years at the address.

I used interviews as the primary source of data because this method is suited to understanding people's personal perspectives and exploring connections between personal and situational factors and behaviour over time (Bryman 2016: 401), and is shown to elicit a finer-grained understanding of how gardening attitudes and behaviour change than survey methods (van Heezik et al. 2012). The interviews were semi-structured and explored interviewees' gardening experiences, interaction with the program, and its impact on their gardening and social connections. Interviews varied from 45 minutes to two hours.

## Analysis of interview data

I analysed interviewees' narratives inductively (Bryman 2012: 384, 404) and compared my findings with recommended conservation engagement interventions. I coded transcripts line by line using QSR NVivo for Mac. Codes were not pre-established but derived from interviewees' responses.

Enough narrative was coded to provide a context for each coded topic; if interviewees covered a number of topics in a single response these were all coded separately with different contextual segments as appropriate. Codes were grouped or merged into 'mother' nodes and finally 'master' categories as part of a fluid, inductive analytical process (Thornberg and Charmaz 2011: 41-51). The five master categories contained codes relating to: 1) the period prior to an interviewee commencing wildlife gardening; 2) the period after commencing; 3) interviewees' interactions with and opinions about the program; 4) interviewees' affective connections with items; and 5) interviewees' views on conservation of urban native biota. Memos were written throughout the coding and analytical process about patterns that were emerging and their interpretation.

### Comparison of interview, demographic, and property data

Demographic data, property location and size, and summary data on interviewees' gardening experience, activities, and reasons for joining the program were uploaded into an Excel spreadsheet. Sortable columns were used to detect relationships between factors and compare responses between interviewees (e.g. Table 4-2 p 52, Table 4-3 p 53).

### Positioning interview findings in relation to G4W member survey data

I used responses to a G4W member survey, designed and conducted by Knox Council in 2009 to assess success of G4W and potential improvements, to provide some reference points for comparison with the interview findings. Although the data sets were collected at different times, key program features were the same over the period, with the exception of a Facebook page added in December 2012. The survey contained both closed and open-ended questions, including several about members' wildlife gardening activities and the usefulness of G4W program features. Ninety-four members responded, representing a 42 per cent response rate. The data included no identifying information so I do not know whether the three of our interviewees who were in the program at that time participated in the survey.

Interview responses were compared to survey responses for any commonalities or notable differences at several reference points. One group of reference points involved survey responses to closed questions about whether respondents had planted indigenous species or removed environmental weeds, and whether the garden assessment was useful. The other group of reference points involved survey responses to the open-ended questions: 'garden assessment comments', 'what has been the most useful part of the program', 'what has been the least useful', 'can you suggest any further improvements for the program' and 'further comments'. To facilitate this comparison, responses to the open-ended survey questions were coded in NVivo for Mac. Coded segments were placed in one or more relevant topical categories. This simple categorisation assisted a high-level



review of the range of topics covered by survey respondents and ready reference to detailed comments in each topic area.

## Results and discussion

In the presentation of results, pseudonymic initials are used for interviewee quotes. No identification is possible for the results of the Knox Council survey.

### Interviewee characteristics

Interviewees were diverse in gender, age, educational qualifications, employment status, country of origin, postcode location, lot size, years at the property, and years in the program (Table 4-1, p 50). Interviewees' gardening experience prior to joining G4W also varied. This was grouped into four categories – inexperienced (two interviewees), backyard (four interviewees), traditional (three interviewees), and wildlife (seven interviewees) – see Table 4-2 (p 52). The wildlife gardening category represents experience planting species native to Australia, the continent. Most of the species used were those widely available in commercial plant nurseries but not indigenous to the local area.

**Table 4-1. Characteristics of interviewees: demographic, property, and G4W membership**

<b>Gender</b>	Male: 9	Female: 7	
<b>Qualifications</b>	Up to High School: 8	Certification: 1	Tertiary/plus: 7
<b>Country of origin</b>	Australia: 12	Europe: 3	SE Asia: 1
<b>Employment</b>	Full time: 8	Part time: 3	Retired: 5
<b>Location</b>	7 postcodes represented		
<b>Age*</b>	<25: 1	55-64: 4	
	35-44: 4	65-74: 2	
	45-54: 3	75+: 1	
<b>Lot size (sqm)</b>	<1000sqm: 6		
	1000-1999sqm: 4		
	2000-2999sqm: 3		
	3000-3999sqm: 2		
	23,000sqm: 1		
<b>Years at address</b>	1 yr: 1	18-21 yrs: 3	
	2-5 yrs: 6	25-26 yrs: 2	
	8 yrs: 2	40 yrs: 2	
<b>Years as member</b>	<.5 yr: 2	4.5-5.5 yrs: 2	
	.5-1.5 yrs: 3	5.5-6.5 yrs: 3	
	2.5-3.5 yrs: 5	7.5-8.5 yrs: 1	

\*One participant did not provide an age category

## Effect of personal and situational factors

### *Age*

While some interviewees believed that age restricted (or could potentially restrict) their ability to perform arduous gardening tasks, this did not deter them from wildlife gardening. If garden size and topography posed challenges, interviewees still applied program recommendations although sometimes at a slower pace.

### *Prior gardening experience*

Interviewees' gardening background prior to joining the program influenced why they joined, but generally not their uptake of program recommendations. A notable exception was three interviewees who had established a strong attachment to their gardening style and garden's form (they had all developed their gardens for over 20 years). One, with wildlife gardening experience, intensified her wildlife gardening activities, extending them into her nature strip. The other two, traditional gardeners, restricted their wildlife gardening to specific areas of the garden but still wanted to contribute, as I10 explained 'the indigenous [plants] ... are the ones that actually belong here. I'm not

willing to give up all the rest but...I think it's important to make some connection with the land, you can't just take it.'

### *Wildlife in the neighbourhood*

Interactions that interviewees had with wildlife in the immediate neighbourhood and at home stimulated their interest in joining the program and were a source of ongoing motivation and satisfaction. These interactions related to the proximity of their gardens to reserves and the presence of particular species in their neighbourhood.

### Reasons for joining

Interviewees learnt about the program through various channels including neighbours and friends, local paper, Knox Council's website, mail or seminar, exhibition stall, or the KES nursery. The majority were not actively seeking information about the program or wildlife gardening when they learned about it.

Table 4-2 (p 52) presents the reasons interviewees provided for joining G4W. These predominantly related to advancing their gardening knowledge and intent. Having an interest in gardening is a key indication for joining. Nine of the 16 interviewees were interested in helping or attracting wildlife when they joined. It is striking that of this group, those interviewees without previous wildlife gardening experience (I13, I11, I15) all described having had moving interactions with wildlife in their gardens or neighbourhood. Encounters with wildlife are known to stimulate interest in their care (Ballantyne and Packer 2011). I15 explained 'we saw the little echidna running around and lizards...the whole thought process [about gardening] changed', while I11 said 'we used to get a couple of king parrots...and there's this little echidna...we just want to get them back'. Notably, only interviewees with prior wildlife gardening experience and intent (I1, I2, I3, I5) joined for free plants or grants.

**Table 4-2. Interviewees' reasons for joining G4W and prior gardening experience**

Interviewee	Reasons for joining the G4W program							Prior gardening experience
	Attract/ help local wildlife	Interest in planting natives	Advice/ Ideas	Funding or free plants	Low maintenance	Support environment generally	Support G4W and local focus	
I1		✓		✓				Wildlife <sup>1</sup>
I2	✓	✓	✓	✓			✓	Wildlife
I3		✓		✓				Wildlife
I4	✓	✓					✓	Wildlife
I5	✓	✓		✓				Wildlife
I6	✓	✓	✓					Wildlife
I7	✓	✓					✓	Wildlife
I8		✓	✓					Traditional <sup>2</sup>
I9	✓				✓			Traditional
I10			✓					Traditional
I11	✓							Backyard <sup>3</sup>
I12			✓			✓		Backyard
I13	✓		✓					Backyard
I14			✓					Backyard
I15	✓							Inexperienced <sup>4</sup>
I16					✓	✓		Inexperienced
Total	9	8	7	4	2	2	3	

<sup>1</sup>Wildlife: Use of native plants for their origin or to support or attract native wildlife, not usually indigenous species

<sup>2</sup>Traditional: Use of exotic flora in semi-formal garden designs

<sup>3</sup>Backyard: Informal garden maintenance usually including mowing lawns and maintaining garden beds

<sup>4</sup>Inexperienced: Establishing/maintaining one's first home garden

Another common reason for joining was interest in planting native species, given by all seven interviewees with prior wildlife gardening experience; one traditional gardener was interested in them as different plant material. Obtaining gardening advice was another common reason, particularly for those without wildlife gardening experience.

There was not a strong drive to wildlife garden to support the 'environment' in the broadest sense of the term. Two interviewees without wildlife gardening experience provided this reason as I12 explained, 'There was no one trigger... if it was needed for the environment, I was happy to try it'.

Three interviewees with previous wildlife gardening experience joined to support the G4W program and its focus on local species.

I thought it was just a really cool initiative from the Council and KES... And I believe in what they're doing. Like getting enough trees...it means powerful owls and the tawny frogmouths and possums actually have somewhere to live and it cools properties as well. (I4)

## Program impact on wildlife gardening activities

Table 4-3 shows the wildlife gardening activities interviewees had undertaken in relation to their prior gardening experience and years in the program. Critically, all had planted indigenous species and all but one had removed environmental weed species as a result of the program, regardless of years in the program or prior gardening experience or intentions. The high reported rate of wildlife gardening activities by interviewees aligns with results from the 2009 survey. All but two respondents answered the question about planting indigenous species; of these 96 per cent reported doing so. All answered the question about removing environmental weeds, and 88 per cent of respondents reported doing so. In a previous study of wildlife gardening activities undertaken by participants in a wildlife gardening program (National Wildlife Federation's Backyard Wildlife Habitat program), 95 per cent of survey respondents said they landscaped with native plants and 58 per cent of respondents said they controlled invasive exotic species (Palmer and Dann 2004).

**Table 4-3. Interviewees' years in G4W, prior gardening experience, and wildlife gardening activities**

Interviewee	Years in G4W	Prior experience*	Remove weeds		Plant indigenous			Protect		Add habitat				No. of different activities
			Plants shrubs	Trees	Plants	Prickly hedge	Trees	Self-seeding indigenous	Trees/w nest sites, stags	Water feature	Frog pond	Lizard shelter	Bee home	
I1	1	W	✓		✓				✓					3
I2	2.66	W	✓		✓	✓		✓			✓			5
I3	2.83	W	✓	✓	✓	✓	✓		✓					6
I4	3	W	✓	✓	✓			✓						4
I5	3	W	✓	✓	✓		✓	✓	✓	✓				8
I6	6	W	✓	✓	✓	✓	✓		✓					6
I7	8	W	✓		✓		✓		✓					4
I8	0.25	T			✓	✓		✓	✓		✓		✓	6
I9	1	T	✓		✓									2
I10	6.25	T	✓		✓				✓		✓			4
I11	0.125	B			✓	✓								2
I12	5	B	✓		✓	✓								3
I13	5	B	✓	✓	✓	✓	✓	✓	✓			✓		8
I14	6	B	✓		✓	✓								3
I15	0.75	I	✓	✓	✓	✓	✓		✓	✓				7
I16	3	I	✓		✓									2

\*W = Wildlife; T = Traditional; B = Backyard; I = Inexperienced. Refer to Table 4-2 footnotes (p 52) for gardening experience definitions

Shaded rows indicate interviewees who received grants for wildlife gardening activities

The extent and range of interviewees' wildlife gardening activities were not related to length of time in the program or prior gardening experience. A few interviewees without experience began with spurts of intensive activity fired up by newfound enthusiasm; for others, newly arrived children or domestic responsibilities reduced time for gardening. Those who had received grants (shaded in Table 4-3) said it helped them tackle costly or challenging activities earlier, particularly weed tree

removal. Grant recipients undertook comparatively more (and diverse) activities than non-recipients, probably due also to the size and location of their properties (e.g. supporting large trees or self-seeding indigenous species).

Interviewees most readily adopted wildlife gardening practices that met their gardening preferences, which aligned with preferences reported in the literature, e.g. using plants with aesthetic qualities, survivability, functional traits like provision of shade or screening, or ease of maintenance (Clayton 2007, Kendal et al. 2012). Interviewees willingly planted indigenous species, particularly for screening, drought resistance, and to attract wildlife. This aligns with findings that the uptake of promoted conservation practices improves if they are compatible with a landholder's existing management practices (Pannell et al. 2006, Race et al. 2012). Some planted indigenous species that were locally endangered to assist in their conservation. A number maintained mature gum trees and if they had to prune them for safety, were retaining trunks and adding nest hollows. Interviewees welcomed the program's approach of letting them choose the pace and extent of their planting and weed removal activities. Some were delaying removal of weed trees until they could implement alternative privacy measures.

Interviewees wished to maintain good neighbourly relations. They had mixed views as to whether their activities influenced their neighbours' gardening. Interviewees felt free to wildlife garden even if neighbours gardened differently but were sensitive to their concerns. One interviewee with large gum trees close to the property line kept her neighbour informed about their health. Another reluctantly agreed to remove a large gum tree on the edge of his property at a neighbour's insistence. From interviewees' feedback and the researcher's observations of neighbouring gardens there was no evidence of 'gardening contagion', as also found by Kirkpatrick et al. (2009).

All interviewees intended to wildlife garden in the future, at current or future properties. Visible evidence of their commitment over previous months or years was present in the indigenous plants and potted tube stock in their gardens.

### Program impact on gardening purpose

All but one of the interviewees reported that their current gardening purpose was to help support or attract the indigenous biodiversity of Knox. This also emerged in comments of some survey respondents, for example 'to care for my garden in a manner which provides for the local creatures from bugs upwards'. The one exception had not had a garden assessment yet and did not express awareness of indigenous species. A few interviewees and survey respondents spoke of helping to propagate or nurture rare indigenous species:

In my front garden there is a little plant there, it's a silver banksia, and I got it from KES, and apparently they're having trouble propagating it... I said if I get any seeds, I'll make sure I gather them and return them to you. (I12)

Most interviewees felt their wildlife gardening was helping Council to achieve its conservation objectives, e.g. removing environmental weeds in their gardens so they would not infest Council reserves, planting rare indigenous species from the nursery, or retaining self-spreading indigenous species such as *Gahnia sieberiana* that support the locally threatened indigenous butterfly *Tisiphone abeona albifacia*. Interviewees appreciated Council's environmental efforts but felt it could do more: to improve the habitat quality of reserves, roadsides and median strips; to promote and support the G4W program; and to involve their neighbours, particularly in removing weeds. Many expressed irritation that Council was planting the weeds they were removing from their gardens. I9 noted 'at the same time here's the Council planting rows and rows of agapanthus [a local environmental weed]. They are a menace'. This program-stimulated desire of residents for Council to play its role in helping them to improve habitat across the landscape demonstrates an incipient aligning of public and private land management for conservation.

### Key program features

There were few criticisms of the program, either by interviewees or survey respondents. Only 56 per cent of the latter replied to 'the least useful' part of the program question, of which 71 per cent gave answers like 'nothing' and 'its all good'. Of the remainder, half wanted more information or resources and the others had a variety of minor complaints. A few interviewees wanted more visits or free plants while acknowledging resource limitations. Various program features supported the development of interviewees' wildlife gardening practices as part of a collaborative land improvement initiative with Council and KES. This commenced with discovering the indigenous biota and conservation potential of their gardens during the garden assessment and continued with the support of a framework that guided and reinforced their wildlife gardening activities.

### *On-site garden assessment*

All interviewees who had received a garden assessment found it useful. Similarly, all 2009 Council survey respondents replied, with a 'yes', to the open-ended question of whether the garden assessment was useful. A number of interviewees reported that the on-site assessment elicited and reinforced a desire to attract or support wildlife. Some indicated that this resonated more strongly than an appeal simply to use indigenous plants: 'If they had said "plant these because they're good for Knox, but they're not going to attract the birds..."', I probably would have said "phhhh, I'll get a

tractor in and make it a lawn” ’ I13. Interviewees and survey respondents described the assessors as experts, helping them to see their garden in a different way, to discover its indigenous species and conservation potential. All interviewees indicated that without the program they would not have known about or fostered indigenous species, removed environmental weeds, or appreciated which of them were in their gardens. For most this recognition first occurred at the garden assessment: ‘they were all walking around out the backyard, “Ooo, look at this,” “Oooo, look at this.” And I go, “Those things? I poison those” ’ I13.

The assessment has the qualities of various factors reported to stimulate pro-environmental behaviour change: a ‘change moment’ with ‘trusted others’ (Robinson and Glanznig, 2003: 37), tailored advice (Snep et al. 2016), arousing emotions (Oskamp 2002), providing role models (Steg and Vlek 2009), enhancing environmental conceptions through experiential impact (Ballantyne and Packer 2011), and a ‘free-choice, self-motivated learning environment’ (van Heezik et al. 2012). Interviewees and survey respondents praised the assessment as one of the best elements of the program. They highlighted the supportive approach and expertise of the assessors, the clear and comprehensive advice and follow-up report, individualised attention, provision of ideas and options not directions, and the introduction to the nursery with vouchers for 20 free plants.

#### *Hubs for personal advice and materials*

Personal advice and face-to-face encouragement reinforced interviewees’ interest, confidence, and motivation to continue. These interactions were highly valued and desired, in the way extension officers are by rural landholders involved in private land conservation (Pannell et al. 2006, Race et al. 2012, Selinske et al. 2015). Selinske et al. (2015) reported that interactive shared learning with an extension officer was the most powerful driver of landholder satisfaction with a conservation program. Interviewees who received grants valued the visits of Council officers as much or more than the material support. One explained ‘they’ve [Council officers] been really, really helpful because you sort of struggle along...every time they come out, we walk around the garden and say, “Now is this a weed” or “What’s this”, and they’re really good’ I6.

For most interviewees, visits to the nursery provided face-to-face advice after the garden assessment. The KES nursery is critically important, not only for making indigenous plants available inexpensively, but also as a hub of advice and inspiration when needed, vital given the stop-start nature of gardening. All interviewees had visited the nursery and appreciated it: ‘I know that I have a place to go if I ever need something’ I16.

Interviewees also appreciated Council’s administrative unit as an information and support hub. Some sought advice via phone or other Council communication media, including a Facebook



page, website and newsletters. Some had contributed to these with posts or articles. I15 described a time when 'I have no idea what to do...So I posted a picture through the program on Facebook. And I was getting an immediate response back, which was ... incredible.' I5 explained:

I do enjoy their website ...If you're straying off the philosophy of the Gardens for Wildlife then you can refresh your memory a little bit and say "Ah, okay. Forgot about that. I've got to go back and do that".

The interaction available, whether face-to-face or through other media, not only provides situational prompts (Werner 1999) and social support (Oskamp 2002), but also reinforcement that others in the community and Council care about their gardening.

### *Experiential learning*

The importance of learning by doing is widely reported in pro-environmental behavioural change (Werner 1999) and conservation practice literature (Pannell et al., 2006). While not all interviewees could see the impact of their gardening in the appearance of more or particular wildlife in their gardens, they could see results in plants growing or weeds gone, as I2 described: 'Yeah success for us was having a clear patch.' Observable results help them persevere, another well reported adoption factor (Pannell et al. 2006, Davidson 2012). I10 related:

I was introduced to the whole idea and then, because I had some plants that worked and then some more plants that worked, then it seemed like a good idea and they managed to live through the drought... and it did noticeably make a difference with the amount of insects.

The increased skills and confidence interviewees gained from their experiential learning reinforced their motivation to continue. I5 noted 'And we feel now more competent in this field than we did before. And our success rate seems to be improving. Yeah. So it's a very positive feeling to be acquiring a skill almost'. I4 was transplanting indigenous orchids he had discovered growing in the lawn of his previous property. He explained how he had discovered them, concluding with '[I] let them grow up... Because we left there they're mowing over them again so luckily we took these specimens'. Some expressed learning itself as a reward: 'That's the best thing about gardening, you're just learning the whole way along' I12. This is similar to how some of Bernardini and Irvine's (2007) participants described their gardening as a dynamic, rewarding process in which they engaged with nature, faced challenges, and experimented, thereby improving their knowledge of their garden and nature.

### *Working in a collaboration*

Interviewees and survey respondents expressed connections with G4W members, Council's G4W arm, and KES as a result of participating in the program. Most interviewees reported that their connections with Council had improved although in relation principally, and sometimes only, to the G4W program and staff. A common sentiment was, 'I think the program's terrific...So that gives me a good feeling about Knox Council even though I think they probably need to do something more with the program' I2. Interviewees also spoke glowingly of KES and the KES nursery – not only for its indigenous plants, but also for the inspirational qualities of its volunteers, and for linking them to people with a shared environmental stewardship ethos. I12 explained 'if you're there at KES buying plants, you're rubbing shoulders with other people who are doing a similar thing'. I3 was even more inspired:

I just get a buzz out of going down to the indig [indigenous] nursery...it makes you feel good about your neighbourhood and the people around and it's not all bad and the world's not bad. There's people that are doing the positive things.

While interviewees did not seek out social interaction with fellow G4W members, most felt a positive connection with them as fellow residents engaged in the same conservation effort: 'I feel good that there are more and more people joining, yeah, because that means there are more and more people getting rid of environmental weeds in the garden' I1. Several survey responses expressed similar positive connections, for example that the most useful part of the program is 'a sense that others are also working to improve the situation for our wildlife'. Unlike the interviewees, some survey respondents had asked for more face-to-face social interaction, suggesting group visits to reserves and open garden events.

### *Endorsement of conservation purpose and value*

In all its communications the program articulates that the goal of residents, Council and KES is to conserve indigenous species. Evidence that other G4W members, KES, and Council are doing so – through newsletters, Facebook posts, events, and the nursery- reinforced the sense of conservation purpose and contribution interviewees felt about their wildlife gardening. For grant recipients, the grants and field visit discussions provided tangible evidence that their land improvements have conservation value. This sense of purpose was also expressed by some survey respondents, for example in response to the most useful part of the program 'feeling that we are doing something perceived to be useful and that there are others doing the same'. I emphasise the importance of conservation endorsement for two reasons: the conservation value of urban gardens can be contested (Shwartz et al. 2014) and the promotion of wildlife gardening is more frequently conducted as education rather than collaborative municipal conservation (Nilon 2010).

## Implications for managing urban landscapes

The capacity of an urban community to solve problems (in this case conserve indigenous biota) and maintain well-being lies in its individuals, formal organisations, relational networks linking them to each other, and the broader social systems of which they are a part (Chaskin 2001). If the desired outcomes are ecological in nature, the scale of the social and ecological processes need to align, requiring social networks between governmental agencies and community groups to address issues at a landscape scale (Ernstson et al. 2010). Preferably, individuals and communities should participate, working with public agencies to learn about, share knowledge, take responsibility for and participate in collaborative environmental decision making (Berkes 2004, Carter and Ross 2012) and through the process, develop a shared language and values for conservation management (Norton 2005).

The G4W program involved members in improving habitat for indigenous biota by removing environmental weeds and planting indigenous species, including rare and endangered ones that the nursery had propagated, on their properties. Members did this to complement Council's conservation activities, particularly of developing stepping stones and corridors, and reducing weed load in bushland patches and buffers. These are well-recognised conservation strategies to improve habitat quality in modified, fragmented landscapes (Bennett and Saunders 2010).

One possibility missing from this program is a system for Council, KES and G4W members collectively nominating conservation species and targets, sharing learning, monitoring results and adjusting plans accordingly. None of the interviewees had ecological or scientific expertise; they felt they had limited understanding of what ecological contribution their gardening was making. Assessing the ecological impact of their gardening activities remains a challenge, with immense temporal and spatial complexities. However, all interviewees were willing to help by providing feedback on their gardening activities, flora, and fauna in a form of citizen science.

Harnessing the potential contribution of wildlife gardening programs to biodiversity conservation in cities requires understanding their socio-ecological impact and ways to measure it, their applicability in other communities, sustainability and scalability. All interviewees intended to wildlife garden in the future, a promising indication of the behaviour's sustainability. However, interviewees indicate that their involvement is supported by ongoing access to personal advice, inspirational program members, reminders of wildlife gardening practice, and acknowledgment that their contribution is important. Scaling up need not be just a numbers game. If, as this study indicates, residents can be engaged to collaborate with public land managers to support targeted flora and fauna, then action, including grant funding, can be strategically targeted in locations and ways that improve habitat for particular species. And if residents who experience wildlife are more

readily engaged to manage their land to support local flora and fauna - as these members were- then involving urban residents living close to habitat patches and wildlife corridors may become progressively easier as habitats are extended and charismatic species spread their visits.

These findings are probably most relevant in situations similar to this case study: urban areas in developed countries hosting native flora and fauna. Next steps include quantifying findings across the G4W membership, assessing their validity in other scenarios, and evaluating the efficacy of the program in conserving targeted species. I also recommend exploring the inclusion of a participatory monitoring and evaluation component in wildlife gardening programs and opportunities for strengthening a collaborative governance and adaptive management approach. Significantly, the approach and features of the case study program are pragmatic and implementable. They show promise as a way to engage urban residents with public land managers to conserve biodiversity across a municipal landscape.

## Conclusion

Wildlife gardening programs can engage a diverse group of residents to manage their land for the purpose of helping their council and community conserve indigenous biota, doing so in a way that aligns their efforts with those of council. This includes residents without prior intention or knowledge of wildlife gardening.

Participants in this study were stimulated to begin wildlife gardening by an on-site garden assessment that provided new understanding of their garden's biota and stewardship potential, along with personal advice and encouragement. Interviewees' interest in and continued wildlife gardening was supported by ongoing availability of indigenous plant species and advice and encouragement through Council and KES physical and digital hubs. Evidence that interviewees' gardening is making a valuable contribution to a Council-community conservation initiative is important to reinforcing their continuation, as are the rewards of gaining new knowledge and competence, and experiencing nature. While the survey data could not speak to this process and relationships, it did underscore the importance of the on-site garden assessment and its qualities, and the widespread involvement of G4W members in removing weeds and planting indigenous species. The survey responses also included similar comments to interviewees about the impacts of G4W on their gardening, support for indigenous species conservation, and connections with Council, other members, and KES.

The study shows that wildlife gardening programs can build relationships between councils, community organisations, and residents around shared, landscape-oriented conservation goals. These networks show promise as an incipient platform for improving the quality of native biodiversity habitat across a municipal landscape by engaging private and public land managers to

work together towards that aim. Successful gardening for wildlife program features include: 1) on-site garden assessment; 2) an indigenous plant nursery hub; 3) visible involvement of council and community; and 4) a locally based framework that encourages learning by doing and endorses the value of each garden's conservation contribution. I have demonstrated here that involving residents in wildlife gardening offers an opportunity to increase community support for conservation and to improve the habitat quality of residential land in cities.

## 5 TRANSFORMING URBAN GARDENERS INTO LAND STEWARDS

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*So then I was able to see Chocolate Lilies for the first time and notice those other things...and then it just kind of went from there. It becomes part of your blood.*

Gardens for Wildlife Member, 2014

### Abstract

This qualitative study explores how urban gardeners were supported to become land stewards through a municipal wildlife gardening program in suburban Melbourne Australia, and how this process occurred. From interviews of 16 program members in their gardens, I investigated how program participation affected their gardening purpose and practice, and attachments to place and nature. Using inductive analysis and a definition of land stewardship that encompasses purpose as well as activities, I developed a model for the stewardship development process. An initiation phase introduces participants to the purpose, activities, and support for stewardship, and their potential to contribute. A development phase follows where connections to place deepen; stewardship knowledge, competencies and activities strengthen; and commitment to stewardship increases. The process is driven by learning by doing with rewarding results, and supported by validation, community involvement, and accessible resources. I caution against undue focus on upstream factors in linear PEB models, like knowledge and attitude, to the neglect of behavioural performance and learning when fostering land stewardship. Of particular importance is considering relationships between factors that occur over a period of time rather than those occurring at a point in time. Private land stewardship values and practice can develop from wildlife gardening, a means to foster urban biodiversity while strengthening connections between residents and nature, place, and community.

### Introduction

Much of the modern sustainability agenda involves promoting pro-environmental behaviours (PEBs) to city dwellers, comprising over 70% of the population in many countries outside of Asia and Africa (United Nations Department of Economic and Social Affairs Population Division 2014). PEBs are behaviours that minimise harm to the 'availability of materials or energy' from the environment or 'the structure or dynamics of ecosystems' (Steg and Vlek 2009: 309). They include actions to conserve biodiversity, a primary goal of the international Convention on Biological Diversity. Understanding how to effectively engage and sustain urban residents in conserving biodiversity is both an ongoing challenge and a research priority (Shwartz et al. 2014).

Diverse theories have been proposed for the development of pro-environmental behaviours (refer to Chawla and Derr 2012; Darnton 2008; and Schultz and Kaiser 2012 for reviews). The most common theories focus on behaviour of individuals, identifying factors believed to affect one's ability or intention to behave. These factors include attitudes, social norms, and perceived control (Ajzen 1991); knowledge, action competence, personal investment, and expectance of rewards (Hungerford and Volk 1990); and emotional investment (Kollmuss and Agyeman 2002). There remains a dearth of research about how the practicing of nature conservation develops from these antecedents (Restall and Conrad 2015). Chawla and Derr (2012: 549-550), reviewing research on the development of conservation behaviours in youth, noted that it 'has been dominated by a focus on knowledge, values and attitudes at the expense of behaviour', and called for more qualitative studies to provide insight into processes of learning and how people themselves interpret experiences.

There is agreement that change approaches should be tailored to a particular behaviour, including its desired persistence (Geller 1995), adaptability (Vare and Scott 2007), context (Schultz and Kaiser 2012), and distinctive characteristics (Darnton 2008). Larson et al. (2015) stress the distinctiveness and importance of land stewardship, a category of PEBs they defined as protecting or improving habitat to conserve biodiversity. These are 'place-based behaviours, which play a critical role in local environmental quality, yet are rarely considered in PEB research' (Larson et al. 2015: 114). There is no one definition of land stewardship, but land stewardship activities described in the literature include preserving and protecting remnant vegetation (Gosling and Williams 2010) and improving wildlife habitat, principally through revegetation (Carr 2002, Huddart-Kennedy et al. 2009, Larson et al. 2015). Alternative definitions, not discussed here, include managing and protecting land for cultural or agricultural purposes (Raymond et al. 2016). What distinguishes land stewardship from other PEBs is its focus on nurturing flora and fauna in specific geographic places. To achieve conservation goals, land stewardship needs to continue over time and to adapt to changing environmental circumstances and species/locale targets (Wiens and Hobbs 2015).

Appeals to conserve nature include doing so for its intrinsic values, its instrumental values (what useful services it provides for people), and more recently its social or 'relational' values, such as to live a meaningful life, preserve cultural value, or strengthen social ties (Chan et al. 2016: 1462). Caring for other species and particular places are acts laden with relational values. Chan et al. (2016) recommend fostering PEBs by understanding the relational values people have with nature and building on them. This work seeks to understand how land stewardship can be fostered in urban residents by building on a relationship many diverse residents have with nature – gardening. Here land stewardship is defined as:

*Caring for the ability of the land in a geographically situated place to support nominated species or communities of flora and/or fauna to persist across the surrounding landscape, as a matter of personal responsibility, for future generations.*

This definition derives from concepts articulated by Aldo Leopold in his seminal essay *The Land Ethic* (Leopold 1949: 201-226): that an ethic guides an individual's actions to cooperate for the good of the community (p 203); that 'the land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land' (p 204); and that a land ethic 'reflects the existence of an ecological conscience, and this in turn reflects a conviction of individual responsibility for the health of the land' (p 221). Importantly, this definition encompasses purpose as well as behaviours, and concepts of nurturing, species conservation, place, landscape, personal responsibility, persistence of action, and supporting the common good across generations. Promotion of land stewardship as defined here has been studied in rural and urban settings.

### Promotion of rural land stewardship

In Western agricultural settings, stewardship on one's own land (private land stewardship) has been promoted from at least the 1940s as a valuable contribution to conservation (Leopold 1949). Leopold accepted that one could manage a rural land holding for stewardship simultaneously with other purposes like agriculture, caring for the land sensitively while supporting the continued existence of native species 'and, at least in spots, their continued existence in a natural state' (Leopold 1949: 204). The focus of private land stewardship remains at the landscape scale and for the common good. Larson et al. (2015) found that a high proportion of rural New York landowners reported participating in private land stewardship (72% doing it often or very often compared with 13% on public land).

There is little published about how rural land stewardship develops. Pannell et al. (2006) highlighted the importance of awareness and learning by doing in rural landholders' adoption of conservation practices. Race et al. (2012), in a qualitative study of Australian rural landholders, found that personal advice and recognition of their efforts from environmental program staff and peers strengthened motivation for private land stewardship. The role of place attachment is unclear. Selinske et al. (2015) found that place attachment motivated rural South Africans landholders to enrol in a private land stewardship program. However, Gosling and Williams (2010) found that place attachment (using a postal survey questionnaire) was not associated with rural Australian landholders' reported conservation of native vegetation and suggested that further analysis, including a more nuanced observation of behaviours, is needed to understand mediating factors.



## Promotion of urban land stewardship

In contrast with rural land stewardship, the promotion of urban land stewardship is a more recent phenomenon and has focused almost exclusively on volunteering to improve habitat on public land (Schwartz 2006, Dearborn and Kark 2010). Much of the research on promoting urban land stewardship comes from close-ended questionnaire studies on the motivations and rewards for volunteering in habitat improvement activities on public lands in organised programs. In these studies, helping the environment, particularly one that they use personally, was the most important motivation for participants; others included learning about nature and expressing personal values (Bruyere and Rappe 2007, Asah and Blahna 2012). When open-ended questions were used the results were ‘markedly different’, with the most frequent responses being to experience positive emotions, contribute to community, and socialise (Asah et al. 2014: 111). Receiving personal and social benefits increased the frequency and duration of volunteering (Ryan et al. 2001, Asah and Blahna 2012). Urban conservation volunteers have also been reported to develop a strong interest in protecting local natural areas and a strong attachment to their volunteer sites (Ryan and Grese 2005).

Very little is written about engaging city dwellers in private land stewardship. Larson et al. (2015: 121) suggested that urban landowners are unlikely to exhibit the high levels of private land stewardship seen in rural locations because of the “unique environmental place meanings and sense of place that often emerges in rural settings” or lack of opportunity. Huddart-Kennedy et al. (2009), while also finding higher rural than urban participation rates in private land stewardship in Canada, found that city-raised Canadians living rurally participated at similar rates to those raised rurally. Neither of these studies investigated how land stewardship develops.

The premise here is that caring for one’s land in the city should have the same potential to evoke land stewardship as caring for one’s land in the country, as ‘in the case of gardening and farming especially, [there is] the rewarding and productive engagement with other life forms and the opportunities to exercise virtues of nurture and care’ (Holland 2006: 133). The work reported here was a component of a revelatory case study (Yin, 2009) exploring how a purposively chosen wildlife gardening program affected participants’ self-reported gardening behaviour, feelings of wellbeing, and connections to nature and place. This sub-study explored how program participants reported the development of land stewardship purposes, materials and activities for their gardening, the impacts on their connections with place and community, and the role of the program in this process.

## Methods

I used a qualitative, interview-based methodology because it is ‘attuned’ to surfacing interconnections between factors and ‘the unfolding of events over time’ (Bryman 2016: 401), required to explore participant’s views of their changing behaviours, purposes, and feelings from

participation in the program. Van Heezik et al. (2012) found that open questions provided a deeper, finer-grained understanding of changes in householders' gardening attitudes and behaviours than closed question surveys used in the same study. Inductive analysis of members' interviews was used to develop a model for stewardship development rather than testing or building on existing frameworks (Bryman 2016: 23-24, 379). Methods are described in detail below. This study received ethics approval from a sub-committee of RMIT University's Human Research Ethics Committee. Pseudonymic initials are used for interviewees to preserve anonymity.

## Case study program

The chosen case study program, Knox Gardens for Wildlife (G4W) (Knox City Council 2016d), is located in eastern greater Melbourne, Australia, with the aim of conserving the area's indigenous species by aligning private and public land management across the municipality. G4W promotes removing environmental weeds, planting and protecting indigenous vegetation and vegetative structure, and providing habitat for indigenous wildlife as private land managers' conservation contribution (Knox City Council and Knox Environment Society 2008). I use the term 'indigenous wildlife gardening' to refer to these activities. G4W was purposively chosen for its purpose, partnership structure, variety of program features, and recruitment of participants since 2006. G4W is a collaboration between an urban council Knox City (Council), and community group Knox Environment Society (KES). KES promotes the Knox environment and runs an indigenous plant nursery that is a key feature of G4W. G4W was founded in 2006 and continues to grow with a membership in 2017 of over 700 households.

Any Knox resident or business can sign up to be a G4W member. Members receive an on-site garden assessment by assessors who explain the program's purpose, identify environmental weeds and indigenous biota in the garden, and advise on specific opportunities for helping to conserve indigenous species. Members then receive an illustrated assessment report, Knox indigenous wildlife gardening booklet, and 20 free vouchers for indigenous plants at the KES nursery. They also receive newsletters and invitations to program events like open-garden days and occasional get-togethers. Members with properties of sufficient size and proximity to a biologically significant site can apply for a grant for their gardening activities. A Facebook page and website provide online information and advice.

## Member sampling strategy

To explore the impact of the program on a heterogeneous sample of members with diverse characteristics and backgrounds, I enlisted the help of a group of 13 garden assessors (Knox City staff and program volunteers), who between them had visited over 200 members' gardens. In a group interview, assessors were asked to nominate features of G4W member diversity. They identified a

range of personal, property, and program-related aspects of membership diversity and then independently suggested potential interviewees they felt displayed a variety of these characteristics. All 32 recommended interviewees were invited to participate; 10 responded and were interviewed. Subsequently the program coordinator invited 106 members on the membership database from across joining years and postcodes; six responded and were interviewed. While the percentage agreeing to participate indicates selection bias for quick response and willingness to be interviewed, the sample was deemed suitable because 1) the research was exploratory, identifying concepts for further testing rather than establishing a theory or generalizable findings; 2) the sample included G4W members with diverse backgrounds as desired (Table 5-1, p 69); and 3) data saturation was reached after 16 interviews (refer Methodology, first paragraph, p 25).

### Data acquisition

I acquired data from interviewees and about their gardens through: 1) a demographic questionnaire; 2) semi-structured interviews at interviewees' homes that included a walking tour of their gardens; 3) observations of the garden at interview; and 4) web and document review to obtain lot size and proximity to parks and reserves. In the interviews, I explored interviewees' gardening experiences and interaction with the program over time, and the effect of participation on their gardening behaviour and reported connections with place, nature and community. A prompt sheet was used as a guide during the interviews. Interviews varied from 45 minutes to 2 hours, were digitally recorded, and transcribed verbatim.

### Analysis

I coded transcripts line by line using QSR NVivo software for Mac (v10.1). Codes were not pre-established but derived from interviewees' responses. For example, if someone spoke about removing weeds, I set up a coding node called 'Removing weeds' and put the coded narrative segment into it. I coded enough narrative about a topic to provide a context for the coded text. If interviewees covered a number of topics in a single response these were all separately coded with different contextual segments as appropriate. I iteratively reviewed coding nodes and transcripts as part of a fluid, inductive analytical process (Thornberg and Charmaz 2011: 41-51) in which emergent ideas and relationships from initial coding were used to develop subsequent analytical categories and nodes. I grouped codes inter alia into descriptive nodes relating to attitudes, feelings and meanings; impacts of G4W program features; gardening activities, purpose, motivations, rewards and challenges; and connections with nature, place and community. I paid particular attention to how and why these elements changed from the time prior to an interviewee joining the program and subsequently, up until the interview.

To understand the development of land stewardship, I considered how interviewees' descriptions of the materials, purpose, meanings and connections associated with their gardening aligned with those of land stewardship and how they evolved. Other qualitative studies have used purpose, meanings, and activities to evaluate the development of pro-environmental behaviour by individuals, although in the context of waste and energy reduction (Hargreaves 2011) and climate change campaigning (Hards 2011). From the interview data I prepared an initial model of a process for the development of land stewardship and the role of program elements. I then re-examined the manuscripts and coded material on a participant-by-participant basis to check for consistency in coding and refine the model.

## Findings and Discussion

I begin with an overview of interviewees' backgrounds. I then discuss urban gardening as a setting for the development of land stewardship. I describe how G4W supported the interviewees' commencement of and persistence with indigenous wildlife gardening activities. I discuss how interviewees' materials, purpose, and feelings for wildlife gardening moved to align with dimensions of land stewardship, drawing out relationships between these dimensions; interviewees' connections with place, nature, and community; and the extent of their wildlife gardening activities. I then present a model for the development of private land stewardship, comparing it to other PEB change models. I conclude with implications for urban native biodiversity conservation, limitations of the study, and recommendations for further research. In the presentation of results, I use pseudonymic initials for interviewee quotes, consistent with those used in Chapter 4, and derived from the interviewee order used in Table 4-2 (p 52).

### Diversity of interviewees and their gardens

Interviewees differed by gender, qualifications, place of birth, employment, age, and length of G4W membership; their properties varied in location, lot size, neighbourhood character, and how long interviewees had lived at them (Table 5-1, p 69; Table 5-2, p 73). Interviewees' gardening experience and style prior to joining G4W also differed, ranging from inexperienced (two interviewees), backyard (four), and traditional (three), to native gardeners (seven) who had used Australian native (not usually indigenous to Knox) plants for their origin or to attract wildlife. Table 5-2 (footnote 2, p 73) provides further description of gardening categories.

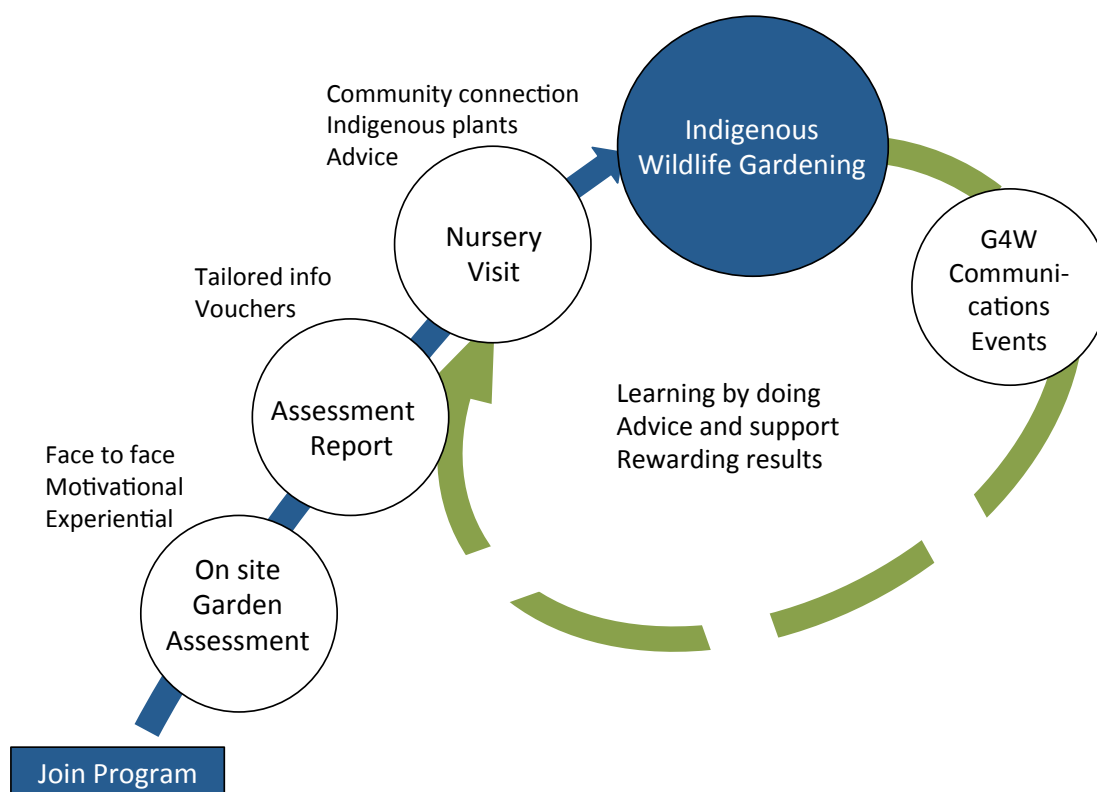
**Table 5-1. Attributes of interviewees and their properties**

<b>Gender</b>		Male: 9 Female: 7				
<b>Qualifications</b>		Up to High School: 8 Certification: 1 Tertiary/plus: 7				
<b>Born and raised</b>		Australia: 12 Europe: 3 SE Asia: 1				
<b>Employment</b>		Full time: 8 Part time: 3 Retired: 5				
<b>Age</b> (one no response)	<25: 1	35-44: 4	45-54: 3	55-64: 4	65-74: 2	75+: 1
<b>Years at property</b>	1 yr: 1	2-5 yrs: 6	8 yrs: 2	18-21 yrs: 3	25-26 yrs: 2	40 yrs: 2
<b>Years in G4W at property</b>	<.5 yr: 2	.5-1.5 yrs: 3	2.5-3.5 yrs: 5	4.5-5.5 yrs: 2	5.5-6.5 yrs: 3	7.5-8.5 yrs: 1
<b>Property size (sqm)</b>		<1000: 6 1000-1999: 4 2000-2999: 3 3000-3999: 2 23,000: 1				
<b>Location</b>		7 postcodes represented				

### Practising indigenous wildlife gardening

All interviewees, irrespective of their gardening background, demographic or property characteristics, or reasons for joining the program, had planted indigenous species and all but one (who had not had an assessment) had removed environmental weeds since joining the program. None of the interviewees knew about indigenous wildlife gardening or how it could be practiced before joining G4W. The G4W program played a key role in engaging members in these activities (Mumaw and Bekessy 2017). Here I posit how this process occurred (Fig 5-1, p 70). This process description serves as a foundation for addressing how urban private land stewardship develops in program participants, given that land stewardship extends beyond practicing stewardship behaviours (wildlife gardening) to adopting stewardship values and purposes.

Figure 5-1. G4W program elements and their role in initiating (solid arrow) and supporting (dashed arrow) indigenous wildlife gardening



Interviewees joined the program primarily to improve their gardening knowledge and gardens; the majority were not actively seeking information about the program or wildlife gardening (Mumaw and Bekessy 2017). Key factors that stimulated interviewees to commence wildlife gardening, depicted by the solid arrow in Figure 5-1, were an on-site garden assessment, assessment report, and nursery visit. The garden assessment was experiential and motivational (Mumaw and Bekessy 2017), highlighting what contribution interviewees’ gardening could make to conserving indigenous species. Interviewees valued the personal guidance and encouragement of assessors. As I10 noted ‘It was much better having someone come out and talk to you...[they] pointed out a lot of things that I could do that would make a difference’. The assessment report, a written record of what was discussed, was used by many interviewees as reference material. Free plant vouchers provided with the report spurred a visit to the nursery and discovery of its use as a hub of advice and support. I14 recalled

It took us a long time to go and use those vouchers... that got us in there, so that was probably the most beneficial thing... [knowing] it was as accessible to talk to people to get the right information.

Commencing indigenous wildlife gardening was a pivotal point:

Initially it was ... not having the knowledge of how to change the landscape to support the wildlife for one. Okay now that we know how to do that, what's the cost involved? and the amount of energy it takes to move something living on a hill...It's very very difficult physically. Sometimes mentally. I15

What helped interviewees to persist? The dashed line in Fig. 5-1 (p 70) represents the continuation of wildlife gardening behaviours. Six key themes, described in the ensuing paragraphs, emerged for what kept interviewees going: finishing a job you start, pacing oneself, learning by doing, access to advice and support, receiving rewarding results, and helping Knox and its environment. In many cases these were inter-related.

First, 'finishing the job' was spoken of by several interviewees, like I13, 'now, if I'm going to plant a plant, it'll be one ...which is indigenous to the City of Knox... because I think, "What's the point? If I've started I might as well continue'. Second, pacing oneself and tackling tasks progressively were described as key strategies for persisting. I2 noted 'we had to shut things out mentally, like we just couldn't look sort of from here down because it was too much and we had to just focus on one area'. These strategies were learned from personal experience or advised by G4W personnel. As interviewees persisted, they took more difficult decisions like removing weed trees valued for shade or privacy.

Third, gaining knowledge and skills through their gardening not only enhanced interviewees' competencies in indigenous wildlife gardening, but also provided motivation and confidence to continue. For example I13, who spoke of continuing to finish the job, also explained he continued because 'I'm starting to learn more about the plants over the years, so I'm having more of an input...I can make it the way ...I wanted it to be'. This aligns with the importance of action competence noted by Hungerford and Volk (1990) and learning by doing as the process by which rural landholders adopt conservation practices that help them to achieve personal goals (Pannell et al. 2006).

Fourth, accessible G4W advice, communications, and events supported interviewees to continue. Face-to-face support was particularly valued, as recounted by I10, 'So they came out and assessed again and so that got me going again a bit. So that personal, somebody coming out to talk to you makes a difference'. Fifth, rewarding results sustained or increased interviewee's efforts, as has been previously reported for PEBs generally (Schultz and Kaiser 2012). Rewards included having gardening success, as explained by I9, 'some of the plants have started to grow and flower... that is good, you feel that's an achievement'; gaining knowledge, as related by I12, 'the program's just given me a focus on learning and watching, and like every day there's something new to learn'; and gaining skills, as explained by I5, 'And we feel now more competent in this field than we did before. And our success rate seems to be improving. Yeah. So it's a very positive feeling to be acquiring a skill almost'.

The pleasure of hearing and seeing wildlife was a key reward and motivation, as described by I4, 'seeing the small insect eating birds and magpies and owls. We get owls here, so that's always good to come out and bang there's a tawny frogmouth'.

Sixth, helping the environment was a key motivator and reward as I12 explained, 'it's helping to protect the environment, and it's just improving the environment. And even though it might be little things in little ways, it's something positive in the outcomes'. This particularly applied to doing something for wildlife, as I14 described, 'you've done something yourself, and that you are creating a garden that matches your environment, and that you can get wildlife into it. Particularly when we see the birds. I think that's the best thing'.

Importantly, working hard to improve one's land strengthened interviewees' feelings for their gardens and their work, as I13 noted 'let's put it this way, if there was a fire...and it whipped through and killed all my plants I would be devastated'.

### Development of land stewardship

In practising indigenous wildlife gardening, all interviewees had carried out land stewardship activities. However, they did not all describe their gardening purpose using land stewardship qualities in terms of caring for Knox' landscape to conserve indigenous species, contributing to the common good, taking personal responsibility, or doing it for the future. There was variety and nuance in articulation and strength amongst and within interviewees' descriptions of their gardening purpose. The persistence and extent of their land stewardship activities also varied. Age, gender, schooling, employment, size of property, employment status, years at the property, and years in the program did not appear to be related to the development or expression of land stewardship characteristics. Table 5-2 (p 73) provides a summary of features of land stewardship associated with each interviewee, ordered by extent of interviewee's stewardship activities. A key point to note is that those interviewees (the last 8 listed in Table 5-2) who expressed more dimensions of stewardship purpose were more actively involved in stewardship activities and articulated strong feelings for Knox as a landscape and community, and for their stewardship work.



**Table 5-2. Interviewees: background information, stewardship purpose and activities, and connections with Knox and their stewardship**

Ref No.	Background Characteristics				Stewardship Purpose Elements <sup>A</sup>							Activities <sup>1</sup>	Connections	
	Prior gardening experience <sup>2</sup>	Neighbourhood character	Given grant	Time in G4W	Lot size sqm	Care for wildlife	Care for indigenous flora	Care for Knox landscape	Help Council / Knox	personal responsibility	For the future	Number Elements Expressed	Intensity of stewardship activities	Deep feelings for Knox & stewardship
I11	Backyard	Suburban		1.5 mo	1000-1999							0/6	LOW	
I16	Inexpcd	Suburban		3 yr	1000-1999							0/6	LOW	
I9	Traditional	Suburban		1 yr	500-799	✓						1/6	MED	
I8	Traditional	Semi-rural		4 mo	5000+	✓						1/6	MED	
I12	Backyard	Suburban		5 yr	500-799	✓	✓					2/6	MED	
I14	Backyard	Suburban		6 yr	500-799	✓	✓					2/6	MED	
I10	Traditional	Suburban		6 yr 3 mo	1000-1999	✓	✓		✓			2/6	MED	
I13	Backyard	Hilly, treed	✓ <sup>3</sup>	5 yr	3000-3999	✓		✓				2/6	HIGH	
I1	Wildlife	Hilly, treed	✓	2 yr 8 mo	3000-3999	✓	✓	✓		✓		4/6	HIGH	✓
I12	Wildlife	Hilly, treed		1 yr	1000-1999	✓	✓	✓		✓		4/6	HIGH	✓
I5	Wildlife	Hilly, treed	✓	3 yr	2000-2999	✓	✓	✓		✓		4/6	HIGH	✓
I6	Wildlife	Hilly, treed	✓	6 yr	2000-2999	✓	✓	✓		✓		5/6	HIGH	✓
I3	Wildlife	Suburban		2 yr 10 mo	800-999	✓	✓	✓		✓		6/6	HIGH	✓
I4	Wildlife	Suburban		3 yr	300-499	✓	✓	✓		✓		6/6	HIGH	✓
I15	Inexpcd	Hilly, treed	✓	9 mo	2000-2999	✓	✓	✓		✓		6/6	HIGH	✓
I7	Wildlife	Suburban		8 yr	800-999	✓	✓	✓		✓		6/6	HIGH	✓

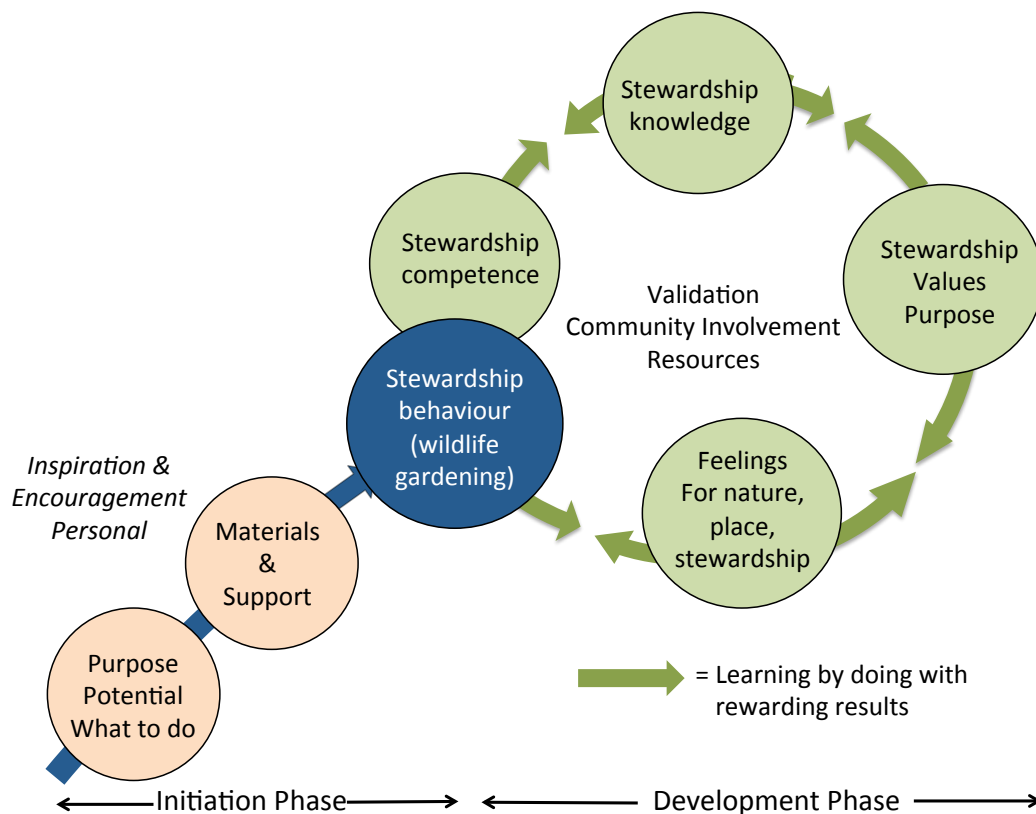
<sup>1</sup>Extent of activities based on interviewee description, author's observation of gardens, and photos or videos of activities if offered by interviewee

<sup>2</sup>Backyard = Informal garden maintenance usually including mowing lawns and maintaining garden beds; Inexperienced = Establishing/maintaining one's first home garden; Traditional = Use of exotic flora in semi-formal garden designs; Wildlife = Use of native plants for their origin or to support or attract native wildlife, not usually indigenous species

<sup>3</sup>✓ = Reported presence of element by interviewee.

Figure 5-2 sets out a model for the development of urban private land stewardship. It has two phases, a first phase comprising initiation to land stewardship, and a development phase comprising the intensification and further development of land stewardship. The model bears similarities to Fig. 5-1 (p 70), but differs in two ways. First, it is concerned with development of stewardship feelings, purpose, and meanings in addition to stewardship behaviour (wildlife gardening). Second, it focuses not on G4W program elements specifically, but rather on the generic factors that help to initiate and support development of stewardship purpose and practice.

**Figure 5-2. A model for the development of urban private land stewardship**



In the initiation phase the beginner is introduced to the purpose, activities, and materials of the practice, along with where to get ongoing support. A critical step is opening participants' eyes to their potential to contribute to improving the landscape and conserving species in their own garden. Kempton & Holland (2003: 331-335) found three key factors for the development of sustained practice of PEBs of various kinds: salience ("waking up" to the issues), identification "as an actor in the world of environmental action", and practical knowledge. With respect to salience, I7 related:

When I joined... Gardens for Wildlife ... I actually went and bought some prickly plants, and when I had a look, I actually had them in the understory...I realised then that I had absorbed it out of the Bird Observer's leaflet [I had received earlier], ... but in the busy

life that you lead with your children, and going to work, and that, I'd forgotten ... I hadn't been able to indulge myself in those messages until I actually got into the Gardens for Wildlife.

Commencement of indigenous wildlife gardening is the juncture between the initiation and development phases of land stewardship. The circular arrows in Fig. 5-2 (p 74) represent that land stewardship develops through a complex interplay between performance of stewardship activities; gaining stewardship competence, confidence, and knowledge; acquiring stewardship values and purpose; and deepening attachments to place, including the local landscape, nature, and community agencies and members sharing the stewardship practice.

### *Gaining stewardship knowledge and competence by doing*

The engine of change in the stewardship development cycle is learning by doing accompanied by rewarding results, represented by the circular arrows in Fig 5-2 (p 74). While action skills and perceived competency have long been identified as contributory factors for development of PEBs in individuals (e.g. Ajzen 1991; Hungerford and Volk, 1990), the means to acquire these skills and confidence, particularly through performing the behaviour as a form of 'learning-by-doing', is generally not explicitly addressed in PEB models (an exception is Chawla's (2009) framework for environmental action). Continuing stewardship action provided learning in the rich sense of growing and developing, expressed by interviewees with higher levels of stewardship involvement and purpose like I5, 'And we feel now more competent in this field than we did before. And our success rate seems to be improving. Yeah. So it's a very positive feeling to be acquiring a skill almost'.

Interviewees who were less involved in stewardship activities expressed fewer stewardship purposes, tended to live in suburban landscapes with less vegetative structure, and reported less wildlife variety than other interviewees. They were less convinced about the ecological value of indigenous wildlife gardening in their gardens, like I10:

I didn't really equate having to have particular plants with having wildlife and I still perhaps don't. I kind of think, if there's somewhere safe for them to go and there's the plants that they will eat if it's not their native ones, then you'll have more wildlife than if you had paddock grass.

I16 is an interesting case. In three years he had only planted three indigenous plants brought to him by an assessor. Although he had decided that anything in the garden that 'dies will not be replaced unless it is a native', he had not planted anything because 'the rotation of plants is much slower than I anticipated'. He had started a vegetable garden, and explained how his feelings for nature were strengthening through this gardening. He left the impression that when he did find

room in his garden for indigenous plants, he might very well strengthen his stewardship purposes and practice together in the manner described by other interviewees.

### *Gaining stewardship values for indigenous plants*

All interviewees, irrespective of the extent of their stewardship activities or purpose, had adopted G4W's values for plants in their gardens and gardening. When they joined the program, no interviewees knew about the indigenous species of Knox and many, if not all, of its environmental weeds. Strikingly, by the time of the interview they all used adjectives like 'right', 'wanted', 'good' or 'needed' to refer to indigenous species and 'wrong', 'a baddie', or a 'spreader' for noxious weeds they pointed out to me in their gardens. Species not designated by the program to be invasive weeds were 'acceptable', particularly native species from other parts of Australia. I14 explained 'If they're natives I'm not as worried as long as there's a lot of indigenous as well... it annoys me knowing that I've got some that shouldn't be there' while I8 said 'I admit I'm cheating; I'm putting a few that aren't necessarily indigenous to this area, but they're native'. These considerations sat beside other needs and connections interviewees had for their gardens:

There's sort of lots of influences on the garden...this came from my Mum who I love, this came from my Sister and the indigenous part has another connection again and I think that's more of a connection to the actual land, you know, that they are the ones that actually belong here. I'm not willing to give up all the rest of it but I do feel that there needs to be that connection with place as well, ...I think it's important to make some connection with the land, you can't just take it. I10

### *Strengthening land stewardship purpose*

Most interviewees had goals of caring for Australian wildlife or indigenous flora. For the last eight interviewees in Table 5-2 (I1, I2, I5, I6, I3, I4, I15, I7), this care extended to the Knox landscape. Notably, they spoke of their homes as an inextricable part of that landscape:

I think I've always sort of shied away from changing the environment into something that it doesn't want to be. I much prefer to use the indigenous species and see the natural wildlife returning ... When you come home and you're driving towards the hills you see it and that's home. You see the trees and it just sort of makes you feel part of where you live. I6

Some interviewees described helping Council or the Knox community as a purpose for their indigenous wildlife gardening, a dimension of the 'common good' stewardship purpose. I13 gave this as a primary reason for his work:

In the backyard, I believe I've pulled out everything that's non-indigenous to the City of Knox, everything. And every plant that's in there that is planted is indigenous to the City of Knox, and there's probably 1,200 of them so far. And I reckon I've got another 500 to put in. So I want it like that because a) I think I owe them that, right, b) I'm not a greenie so I don't care whether the plant comes from the City of Knox or from the middle of Western Australia, I don't care, but if that's what makes them happy and attracts the wildlife I'm happy to do that.

Another attribute of land stewardship is taking personal responsibility for caring for the land or indigenous species, expressed by nine interviewees. I15 explained, 'I feel like we take more of a sense of ownership'. Sometimes this was expressed as a form of 'giving back to place', like I3, 'For me it was about ... putting some of the structure back in that was being lost...giving back to the place, trying to re-establish that', or I15 'By our own little patch of land, we're trying to give back to the area, by just planting indigenous and things like that'. Some interviewees mentioned working for future generations, like I7, 'it was also about my future grandchildren... I realized that on my watch, I planted every weed known to man ... I wanted to redress that'.

Purpose, values, and beliefs, in association with practice, are important and dynamic factors in the transformation of interviewees from gardeners to land stewards. G4W land stewards assign stewardship purpose, meanings and potential for their gardens, plant materials, and activities. Similarly, Hargreaves (2011: 94) found that office workers conceived of and reacted to routine office practices differently after involvement in an energy conservation program 'as new pro-environmental meanings, skills and stuff were incorporated into normal working life'.

### *Deepening feelings for nature, place, and stewardship*

All interviewees expressed growing attachments to nature as a result for their gardening. For example, I16, a first-time homeowner and G4W member for 3 years, who had undertaken the least indigenous wildlife gardening (although he had planted a vegetable garden), explained:

It [my gardening] has certainly enhanced it [feelings for nature], amplified it...when I was younger I... did a lot of hiking and walking and so it started out with experiencing like rocks, mountains, the outback...I experienced it as a challenge. It didn't have that attachment feeling to it... It [the garden] is so much more immediate...Here I open the door and I'm just there, you know.

Interviewees who were heavily involved in land stewardship activities and described gardening purposes aligned with many facets of land stewardship purpose, expressed intense and intensifying feelings for nature. They lived in both suburban and more wooded environments; seven of these

individuals had some experience planting native species to attract wildlife prior to commencing G4W. I15 explained, 'And that grows. It's not just something you go "yep we're connected. We're now connected with nature"...for me it just keeps growing, that feeling'.

These interviewees also described deepening attachments for Knox the place as landscape and community. I6 explained, 'I just really love the natural environment. When we go on holidays, this place is so hard to leave because it's so beautiful. We love coming home'. I5 related:

I don't think I'll ever lose that connection to nature, but this is keeping me very much focussed on it. Because I see the growth that's coming in the plants each year and the seasonal changes and that sort of thing, and it just, it becomes part of my life.

They valued Knox City, KES, and other G4W members as co-contributors caring for indigenous species and the landscape. I3 and a few others described this community involvement as inspiring:

I get joy out of the critical mass that surround it, I think there's about 400 members, you know, hold on this is quite a movement, this is great. Initially when I started I thought, I'm the only one, 'cause you look around- and then there's people everywhere doing it. I3

In her review of place attachment research, Lewicka (2011) concludes that place is an object of strong attachment although the relationships between who gets attached, to what features of place, why and how attachment occurs, and how that attachment might be expressed in behaviours, remain poorly understood. Lewicka (2011: 226) does note that studies show 'a positive relationship between strength of place attachment and strength of neighborhood ties'. Various studies report that having and making experiences in a place is a key mechanism by which people learn about place (Measham 2006) and develop emotional connections to its environmental qualities (Carr 2002, Rogan et al. 2005). My findings corroborate this. There was no evidence that the suburban setting diminished interviewees' developing attachment to their land, nature, or indigenous species of place.

Similarly interviewees displaying high stewardship activity, expressing many aspects of stewardship purpose, and reporting strong feelings for Knox, described strong attachments to their stewardship. Their stories suggested that they did not carry out these activities *because of* previous strongly held purposes or beliefs but rather, that stewardship behaviour and purpose strengthened together in a mutually reinforcing way. Caring for the land had become 'part of their life', or a 'life-long hobby'. I3 explained:

So then I was able to see Chocolate Lilies for the first time and notice those other things, like the other smaller or interesting things, and then it just kind of went from

there. It becomes part of your blood, I guess, you know, like, what you're used to and what you're comfortable with and it kind of just sits well within the landscape.

### *Validation, community involvement and resources*

In the centre of the stewardship development cycle (Fig 5-2, p 74) are three components whose presence or absence respectively may promote or hinder the process: validation, community involvement, and resources.

Validation refers to information and feedback that one's efforts are contributing to conservation and habitat quality from parties that are knowledgeable and responsible. In this study, validation came through communications from KES and Council with interviewees about the importance and appreciation of their efforts, especially when given in person. The feedback had weight because Council is the primary public land manager, KES and Council are perceived to have relevant expertise, and both are demonstrably involved and committed to the program.

Knowing that the community is involved – Council, KES, and other G4W members - was important for interviewees. This aligns with findings that people are more apt to take up behaviours if they are presented by individuals they trust and find credible (Moseley and Stoker 2013), and if the behaviours 'are part of, and seen to be part of, a coherent and consistent response' (Lorenzoni et al. 2007: 454), making people feel that their contributions are making a difference (Quimby and Angelique 2011).

Resources refers to situational or contextual factors that make it easier or harder for individuals to carry out stewardship activities, once they have been introduced to issues and possible actions (Steg and Vlek 2009, Schultz and Kaiser 2012). Interviewees described these factors as available time and dollars, accessible and reasonably priced indigenous plants, access to personal advice (at the nursery or Knox City or from open garden days), and prompts from printed and electronic communications like G4W newsletters, websites and Facebook posts.

### *Urban gardening as context for developing land stewardship*

Urban gardening provides a different context for the development of land stewardship than volunteering on public land or in rural contexts. First, gardens are viewed more strongly as places that 'make a house a home' than as places to 'learn about nature, or to 'care for the planet' (Bhatti and Church 2004: 45). Other studies have discussed the lack of connection gardeners make between their gardens and the neighbouring environment (Clayton 2007, Dahmus and Nelson 2014), questioning whether providing this knowledge would facilitate development of environmentally sustainable gardening behaviours. Similarly, a study of British birdwatchers concluded that the

number who consciously gardened to support birds was 'surprisingly low' (Cammack et al. 2011: 317) because they did not perceive their gardens as places where they could improve habitat for these birds. Findings about G4W here and previously reported (Mumaw and Bekessy 2017) point to how personal guidance and encouragement about the value of wildlife gardening for conserving local flora and fauna is an important motivating factor.

Second, while gardening can be seen as a chore and unrewarding work with sometimes disappointing results, a significant number of people make deep connections with nature through their gardens and gardening (Bhatti and Church 2004, Bernardini and Irvine 2007). In this study, every interviewee who had had a garden assessment (all but one) related that their gardening strengthened their feelings for nature - nature that was at their back door. This applied whether interviewees had done much or little indigenous wildlife gardening since joining the program.

Third, homes are 'places that are the focus of deep attachments and places that are ingredients in our sense of identity' (Holland 2006: 122). When caring for nature is practiced on one's residential land, it becomes intertwined with the qualities and relationships of home and family. Several participants recalled their indigenous wildlife gardening activities as memorable because they were shared with family, like I3. 'and we have a young son with a little bit of a learning difficulties, and ... this is, you know, great for him', or I7. 'one granddaughter in particular, she's just got such an affinity for it'.

Fourth, homeowners have personal control over and responsibility for their gardens. They make their gardening choices amidst an array of ecological, historical, institutional, cultural and technical constraints and opportunities (Cook et al. 2012). Being able to choose the pace and extent of their indigenous wildlife gardening activities was important to interviewees, as I12 noted, 'they emphasize ..."we're not here to tell you how to do your garden, or how to set it up"...I'm absolutely rapt in that cause it's an experiment'. This aligns with reports that developing 'internalized motivation' for PEBs is fostered by supporting people's autonomy while making 'a strong request for change combined with a rationale for the needed change' (Oskamp 2002: 315).

Last, urban residents must satisfy their various aspirations and land use objectives within the limited confines of an urban property lot, generally in close proximity to neighbours. Most interviewees were keeping some exotic species for aesthetic or other personal reasons or delaying removal of weed species, particularly trees, until alternative measures could be put in place. This approach is also reported in peri-urban and agricultural landscapes where landholders intersperse exotic and indigenous plantings to satisfy aesthetic needs by 'planting a species deemed visually amenable, while providing benefits 'for nature' by including species that were good habitat' (Wyborn et al. 2012: 251). The characteristics of interviewees' gardens were influenced by their previous



management, soil conditions, and topography as well as the gardening activities of interviewees. Interviewees' choice of indigenous wildlife gardening activities at a variety of paces in diverse gardens produced an equally diverse array of gardens-in-progress. Examples of plantings and habitat features in different properties are shown in Fig. 5-3.



**Figure 5-3. Photos of G4W wildlife gardens**

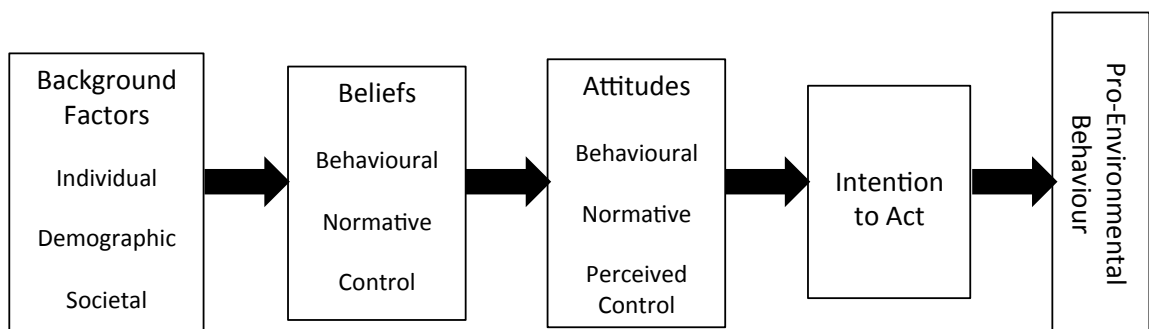
a. Indigenous planting/structure in suburban front garden, with more usual suburban garden frontage to right.  
b. Frog pond in suburban back garden. c. Indigenous planting in hilly, treed front garden. d. Indigenous planting in suburban back garden.

The conservation outcomes of interviewees' wildlife gardening (apart from environmental weeds removed, indigenous species planted, or habitat features retained or added) were not able to be measured within the scope of this study. Conservation 'success' in the context of the urban residential setting would be determined by how a garden assisted a species or community of species, each with their distinctive ecological needs, to persist (Lindenmayer and Fischer 2006, Goddard et al. 2010b).

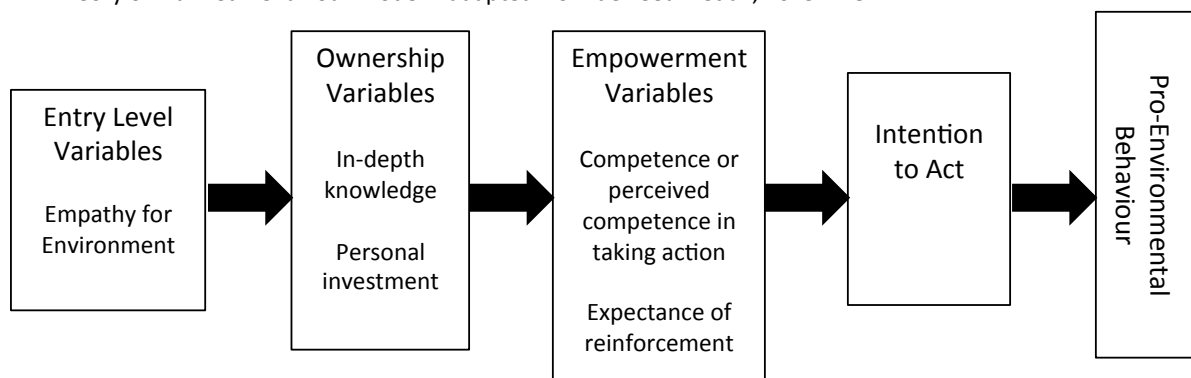
## Time and models of behaviour change

The model presented in Fig. 5-2 (p 74) describes the development of land stewardship *over time*, as inductively derived from this exploratory case study. It shows that land stewardship develops through a complex interplay between performing stewardship behaviours; improving stewardship competence, confidence, and knowledge; and deepening stewardship purpose, beliefs, and attachments. These are interesting insights in a context where ‘almost all research in EP [environmental psychology] has relied on static outcomes at one point in time thus missing a critical component of human behavior-maturation’ (Winkel et al. 2009: 324). It is important to understand and distinguish between models describing the relationship between factors that occurs *over a period of time*, and those describing the relationship between factors *at a point in time*. For example, the theory of planned behaviour (Ajzen 1991) and its variants take a ‘snapshot in time’ of how behaviour or intention to behave (the dependent end variable) is affected by ‘precursor’ variables including beliefs, attitudes and norms. There are many PEB models in the literature (refer Darnton 2008 for various examples) depicting the development of PEB as a linear process (e.g. Fig. 5-4) with the behaviour shown as the endpoint. These depictions omit what impact performing the behaviour itself has on ‘precursor’ variables over subsequent iterations.

**Figure 5-4. Linearly presented PEB models with behaviour as endpoint**



A. Theory of Planned Behaviour Model – adapted from de Leeuw et al., 2015: 129



B. Environmental Behaviour Model – adapted from Hungerford & Volk, 1990:260

In his paper on the theory of planned behaviour, Ajzen (1991: 181) notes that 'For ease of presentation, possible feedback effects of behaviour on the antecedent variables are not shown'. Yet omitting feedback loops may limit insights and cause practitioners to focus interventions on 'precursor factors'. This study's findings reinforce that consideration should be given to how the PEB development process works over time, including the role of learning from carrying out behaviours. Studies investigating sustainability or development of other PEBs over time report a similar interactive process between the growth of knowledge, beliefs and feelings, and action. In a study about climate change behaviours in the U.K., Lorenzoni et al. (2007: 446) write that engagement is 'a personal state of connection with the issue' in three dimensions: cognitive, affective, and behavioural and develops from complex interrelationships between the three (Lorenzoni et al. 2007, Whitmarsh et al. 2012). Another study of U.K. climate change campaigners found that 'the relationship between values and action is complex and bi-directional' (Hards 2011: 37). Hards (2011: 37) described three related mechanisms that shape environmental values: practising the behaviour, having reinforcing 'sensory, mental and emotional' contextual experiences, and interacting with like-minded people (Hards 2011: 37). A feedback loop also aligns with findings of others showing how important practicing PEB, in rewarding contextual experiences, is to shaping related values, knowledge, and feelings (Lorenzoni et al. 2007, Hards 2011). Darnton (2008: 39-56) provides examples of 'theories of change' that include a temporal process that can provide additional insights for PEB development. Chawla (2009) presented a framework derived from syntheses of behavioural research on how children develop conservation behaviours over time, showing a feedback loop between taking action; developing knowledge, confidence, skills, and motivation for conservation behaviour; and reflection and adaptation. Darnton (2008: 39-56) provided an array of examples of models for a wide range of behaviours, including PEBs. He distinguished between 'models of behaviour', designed to explain determinant factors underlying behaviour and tending to be linear, and 'theories of change', which show how behaviours change over time and demonstrate that 'change is a process, not an event' (Darnton, 2008: 1).

### Implications for fostering urban native biodiversity conservation

The G4W case study shows that urban residents can readily be involved in nurturing the ecological quality and indigenous species of the land they live on by introducing them to the potential they have to contribute and how they can do it, building on relationships they have with nature at home, and providing a supportive framework with credible community partners. To Cameron's question (2003: 173-174): 'How possible is it to move people to change the way in which they dwell on Earth in ecologically desirable ways through the vehicle of their own daily experience, their love of place, rather than fear of eco-catastrophe, appeals to the moral rights of other species or to a vision of ecotopia?' - these findings support the reply 'very possible'.

If conservation is only promoted to urban residents as protecting remote ecosystems or public reserves and requiring specialist expertise, it comes to be seen as 'not, by and large something people do, but something that is done for them or, sometimes, to them and their land' (Adams and Mulligan 2003: 295). This limits development of a powerful mechanism – private land stewardship – for engaging urban communities in caring for the environments they live in. As one of the few mechanisms to improve the habitat quality of the residential land matrix this is a powerful complement to other urban biodiversity conservation activities. Adopting a pragmatic approach that accommodates a mixture of native and non-native species in a garden and multiple land use objectives can help engage more residents, who over time increase their commitment to land stewardship and shape their gardens accordingly. Private land stewardship, with its ethic of taking personal responsibility to care for the land and its species over time for the common good, provides a good foundation for urban biodiversity conservation with its need to adapt to changing circumstances. The use of a collaborative framework involving local government and community group hubs not only supports participants to continue, but builds shared goals and relationships that can be deployed to conservation at a landscape scale. Connections with place, nature, and community that deepen with interviewees' stewardship ethic and practice suggest that interlinked social and ecological benefits can arise from fostering urban private land stewardship.

Coming from an exploratory qualitative study using a small sample of G4W members, these findings cannot be extrapolated to the G4W membership as a whole, generalised, or directly transferred to other populations. Unfortunately, it was not possible to identify G4W members for interview who were unhappy with the program or wildlife gardening, or discontinued wildlife gardening activities. A previously reported survey of the G4W membership found few criticisms of the program and a substantial uptake of wildlife gardening activities (Mumaw and Bekessy 2017). The findings reported here should be interpreted as highly nuanced insights into a modelled process for developing land stewardship over time, secured from a group of urban wildlife gardening program members who adopted stewardship behaviours, values and purpose to varying degrees. The study did not incorporate data from G4W members who disagreed with or did not partake in wildlife gardening. The study's findings could be tested and enhanced in future work by quantitatively testing some of the posited relationships from the broader program population and other populations; using theoretical sampling to test and refine the model, such as looking for alternative examples or 'failures'; or testing the utility of the model to interpret findings in other land stewardship development programs.

## Conclusion

This investigation found empirical evidence that urban private land stewardship can be readily fostered through a program that builds on a common urban residential relationship with nature in

the distinctive context of home – gardening. A partnership between a community group and local government provides a framework that first introduces residents to the potential of their gardening to contribute to species conservation and where ongoing advice and materials can be obtained. Once residents commence their conservation-oriented gardening activities, a stewardship development process can begin. Stewardship competencies and confidence increase, along with attachment to stewardship practice and belief in its purpose - a non-linear engagement of hearts, heads and hands. Connections to nature, place and community strengthen concurrently. Learning by doing, with rewarding experiences and supported by accessible resources, validation of the contribution by credible parties, and involvement of community members, drives the process. Acknowledging a meaningful role for individuals and their gardens is critical. Engaging urban residents to care for their land as part of a community can help to improve habitat quality of the residential land matrix while building connections with place and the social fabric of a community.



## 6 STRENGTHENING WELLBEING OF URBAN COMMUNITIES THROUGH WILDLIFE GARDENING

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*It makes you feel good about your neighbourhood and the people around and it's not all bad and the world's not bad. There's people that are doing the positive things.*

Gardens for Wildlife member, 2014

### Abstract

Conserving biodiversity and advancing wellbeing are goals usually siloed in environment or health portfolios, yet compelling evidence is emerging regarding the relationship between these activities. There is increasing academic and practitioner interest in the wellbeing benefits to be gained from experiencing nature in urban parks. Here I explore the understudied relationship between actively conserving nature in urban backyards and gaining wellbeing benefits. I investigated a municipal wildlife gardening program run by a community group-local government partnership in Melbourne, Australia whose purpose is to conserve the municipality's indigenous biodiversity. Semi-structured interviews with program members in their gardens, supplemented by material from open-ended questionnaires from program garden assessors, were analysed for the program's impact on informants' wellbeing. Informants described experiential, social, and eudemonic wellbeing benefits including strengthened connections with nature, place and community, derived from participating in a program that immersed them in nature at home, gave their gardening a conservation context, and involved local government and community. These findings demonstrate that initiatives engaging urban residents on their properties to foster indigenous biodiversity as part of local government-community collaborations have important wellbeing and environmental outcomes that should be recognised and further explored in both conservation and wellbeing policy and program approaches.

### Introduction

Improving the wellbeing of citizens is a stated priority of many governments (Austin 2016, Mensah et al. 2016). There is no singular definition of individual wellbeing (La Placa et al. 2013) but it is generally associated with multi-dimensional phenomena related to quality of life (Bache and Reardon 2013, Austin 2016), and going above and beyond simplistic measures of health status or the absence of disease (World Health Organisation 1946). Conceptually, individual wellbeing derives from physical, psychological, social and spiritual components (La Placa et al. 2013, Taylor 2015, Austin 2016); is context specific; and can vary over time (Kapteyn et al. 2015, Woodhouse et al. 2015). While the attributes of individual wellbeing and how to measure them continue to be debated (Austin 2016), there appears to be some consensus on "markers" of wellbeing, that is, "things that are either constitutive, productive or indicative of wellbeing" (Taylor 2015: 75). These include components able

to be objectively measured, for example material living standards, health status, and educational levels (Stiglitz et al. 2010), and those largely self-defined: having social connections, supportive personal relationships, and development opportunities (La Placa et al. 2013, Taylor 2015), political voice and personal security (Stiglitz et al. 2010), and feelings of happiness, life-satisfaction, self-worth, and purpose (Dolan et al. 2011, Taylor 2015). Here, subjective wellbeing is defined as any components that individuals describe as generating feelings of quality of life, connection, positivity, achievement or personal growth.

Individual wellbeing derives from and contributes to wellbeing in family, community and societal domains, all of which are affected by a range of social, environmental, and economic conditions (La Placa et al. 2013). The importance of wellbeing and both its objective and subjective measurement as key policy objectives is attributed to recognition that inter alia, achieving economic indicators of prosperity (e.g. gross domestic or national product) can be at the expense of quality of life for some sectors of society and the sustainability of the resources (e.g. environmental resources) used to achieve that prosperity (Stiglitz et al. 2010, Bache and Reardon 2013). Subjective wellbeing data can also be a means for citizens' opinions about their quality of life to be considered in policy formulation, and in turn, to evaluate the effectiveness of societies (Stiglitz et al. 2010, Bache and Reardon 2013).

The physical wellbeing benefits to communities provided by natural environments (e.g. food, shade, air purification, clean water, storm water mitigation) are often valued and quantified economically (McDonald 2015). However the range of physical, psychological, and cultural wellbeing benefits from interacting with nature, while recognised to some extent, are less understood and poorly considered or integrated in environmental and public health policies (Wells and Donofrio 2011, Russell et al. 2013, Mensah et al. 2016). This is a particular issue for urban local governments, whose residents are often disconnected from nature or lack the opportunity to have everyday experiences in nature (Puppim de Oliveira et al. 2011, Soga and Gaston 2016).

At the same time, the importance of urban local governments to address biodiversity loss has increased with the growth and environmental impact of cities (Puppim de Oliveira et al. 2011, Secretariat of the Convention on Biological Diversity 2012). With warnings that reduced interaction with nature not only diminishes residents' wellbeing but also the stimulation of their interest and involvement in caring for nature (Soga and Gaston 2016), understanding how to engage urban residents with nature is an outstanding research and action challenge (Shwartz et al. 2014). This paper explores how participating in a new form of urban nature conservation – municipal wildlife gardening – affects wellbeing of participants as construed by them, and discusses the implications for the development and evaluation of urban biodiversity conservation programs. By conservation I

mean any activities directed to fostering the persistence of native species into the future. I begin with a brief overview of the socio-ecological context of urban biodiversity conservation and the importance of involving residents, and follow with the wellbeing benefits attributed to different urban nature experiences, from experiencing parks to environmental volunteering. I then describe municipal wildlife gardening and introduce this empirical study.

### Socio-ecological context of urban biodiversity conservation

The urban landscape is a complex and fragmented one, with an array of modified biotic habitats occurring across spatial mosaics with different histories and types of land use, ownership patterns, governance institutions, and demographically diverse communities (Kowarik 2011, Pickett et al. 2011). These circumstances call for multiple, flexible conservation strategies (Chapin III et al. 2010) and the participation of local individuals, community groups and government agencies (Andersson et al. 2014) responsible for the parcels of public and private land that comprise the landscape in aligned conservation land management practices (Ernstson et al. 2010, Goddard et al. 2010b, Threlfall et al. 2016).

Residents are important potential land conservation actors since: residential gardens comprise a sizable proportion of urban land, suggested to be the largest component of urban greenspace (Mathieu et al. 2007) (e.g. measured as 36% of the area of Dunedin, New Zealand (Mathieu et al. 2007) and between 22% to 27% in 5 major UK cities (Loram et al. 2007)), and because gardens can play a meaningful role in conserving native flora and fauna (Hunter 2005, Doody et al. 2009, Goddard et al. 2010b). However, the reality in cities is that many forms of land, including residential holdings, are undervalued as conservation spaces and there is poor engagement and networking of land users with capacity to contribute (Ernstson et al. 2010). In developed countries particularly, conservation is often disconnected from residents' daily lives, instead seen as the province of experts or paid professional staff (Adams and Mulligan 2003).

### Wellbeing benefits of interacting with nature

Psychological, cognitive, physiological, social, and spiritual wellbeing benefits are reported from interacting with nature (Maller et al. 2006, Russell et al. 2013, Keniger et al. 2013). These include increased self-esteem, reduced anxiety, improved mood, attention restoration, improved cognitive function, stress reduction, and social cohesion. Much of the evidence is correlational (Keniger et al. 2013). Studied interactions generally involve experiencing or interacting in (rather than managing or caring for) nature and there has been significant interest in identifying key ecological features that stimulate wellbeing benefits, largely in the conservation literature (Keniger et al. 2013).



However, one's feelings, motivations, and the context for a nature experience will also influence its impact (Darnton 2008), and these attributes are often considered in public health literature (refer Husk et al. 2016 for examples). Gardening is a form of urban nature experience that goes beyond immersion to hands-on cultivation, performed in a very different context than a park. Bernardini and Irvine (2007: 661) found 'remarkable differences' between urban UK householders' relationships with nature as urban green spaces and as home gardens. Accessibility, control, and privacy were key distinguishing features of home gardens (Bernardini and Irvine 2007). Public green spaces were viewed primarily as places for the community to have outdoor space, to meet, and to relax, while home gardens were seen as places to personally enjoy nature, learn about the natural world, and to care for it. Importantly, gardening not only provided wellbeing from experiencing nature but also self-esteem and self-efficacy, associated with being creative and tending nature (Bernardini and Irvine 2007). Quantitative studies have reported wellbeing benefits from gardening that include experiencing nature, relaxing, and feeling achievement from hands-on managing of the garden (Clayton 2007), and feeling greater life satisfaction in terms of overall health, physical activity, optimism, and energy (Waliczek et al. 2005). In an allotment gardening study, older participants ( $\geq 62$  years) reported greater health and life satisfaction, more social contact, and less stress and loneliness than their neighbours without an allotment, although these differences were not seen in younger participants (van den Berg et al. 2010).

Another form of hands-on caring for nature is volunteering in nature improvement programs. Husk et al. (2016) undertook a systematic literature review of the health and wellbeing benefits derived from participating in volunteer environmental enhancement programs. The authors excluded from their review any activities which did not involve physically changing the environment or which were undertaken in private such as domestic gardening. Study participants were adult volunteers or referred by a healthcare professional. The qualitative studies reviewed by Husk et al. (2016) showed high levels of reported wellbeing benefits including physical activity, immersion in nature, psychological benefits, social contact, personal achievement, knowledge growth, and developing a sense and pride of place. The conservation purpose of the activities was reflected in some wellbeing benefits, particularly feeling personal achievement in caring for nature and thereby helping the community (Burls 2007, Husk et al. 2016). Given these results, researchers have suggested that conservation volunteering can serve dual purposes of improving human wellbeing and improving natural habitat (Moore et al. 2006a, Burls 2007, Molsher and Townsend 2016).

Traditionally, opportunities for urbanites to participate in nature conservation have focused on volunteering in environmental programs on public land (Schwartz 2006, Dearborn and Kark 2010). However, there is growing recognition that residents can contribute to conservation through wildlife gardening, which involves removing environmental weeds, cultivating indigenous flora, and

improving habitat for native species in one's own garden (Doody et al. 2009, Goddard et al. 2010b). There is little research on the wellbeing benefits of wildlife gardening, although it seems likely that benefits would include those associated with gardening at home *and* environmental volunteering in public spaces. In the one study it was found that 17 of 20 interviewed UK wildlife gardeners reported that wildlife gardening improved their quality of life, manifested as feeling 'peaceful', 'reflective', 'wonderment', and also, 'doing their bit' at home for species in decline (Goddard et al. 2013: 264).

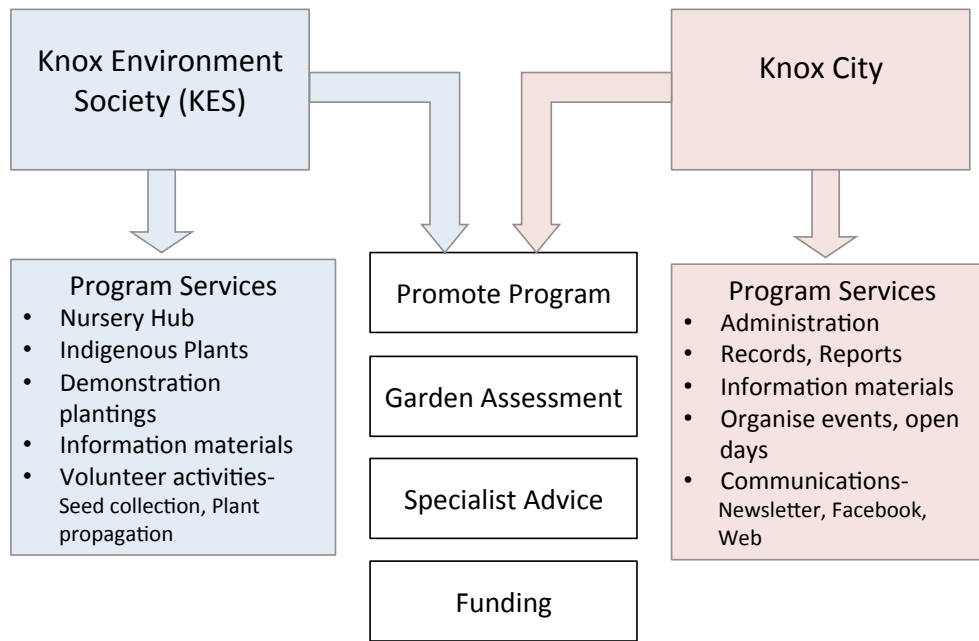
I report here on a study within a larger qualitative, revelatory case study (Yin 2009) of a novel form of municipal wildlife gardening structured as a local government/community group conservation partnership. My case study uses interview data from a variety of actors and inductive analysis to explore how such a program can build urban community capacity to care for its native biodiversity and foster wellbeing. Findings from other aspects of the study are reported elsewhere (Mumaw and Bekessy 2017 – Chapter 4), (Mumaw 2017 - Chapter 5). This study explores the perceptions of participants about the effects of program participation on their wellbeing and connections to nature, place, and community, and the implications for the development and evaluation of urban biodiversity conservation programs.

## Methods

### The study program – Knox Gardens for Wildlife

The Knox Gardens for Wildlife program (G4W), commenced in 2006, is a partnership between a local government (Knox City) and community group Knox Environment Society (KES) in greater Melbourne Australia (Fig. 6-1, page 91). Over 600 demographically diverse households participated in the program at the time the study was conducted and, according to organisers, membership continues to grow. G4W engages residents to help Knox City and KES to conserve the municipality's indigenous flora and fauna by removing environmental weeds, planting indigenous species (available at the KES nursery), and improving habitat in their gardens (Knox City Council and Knox Environment Society 2008). Any resident can join and receive an on-site garden assessment, newsletters, and invitations to events such as open-garden visits. Ongoing advice and support are provided by KES nursery and Knox City program hubs.

Figure 6-1. Gardens for Wildlife program services



Separate services from Knox Environment Society and Knox City (shaded boxes) and joint contributions (unshaded boxes)

## Methodology

This study addressed the question: what are the effects of participation in a community wildlife gardening program on participants’ perceived wellbeing and connections with place, nature, and community? Data were sought from two groups: G4W garden assessors, and a sample of G4W members purposively selected for heterogeneity, rather than as a representative sample. G4W garden assessors are Knox City staff or G4W volunteers (many of whom are also G4W members) whose role is to supportively promote wildlife gardening to G4W members, identifying opportunities during garden assessment visits.

A qualitative, interview-based approach was used to assess study participants’ subjective wellbeing. This is a recommended approach for understanding people’s personal perspectives and exploring connections between personal and situational factors and behaviour over time (Bryman 2016: 401), and specifically for eliciting and understanding personal feelings of wellbeing in relation to changing circumstances or the occurrence of intervening factors (Milner-Gulland et al. 2014, Woodhouse et al. 2015). Our methodology does not allow findings to be directly transferred to other people or groups, or generalised; its purpose was exploratory, to identify patterns and relationships for further testing. This study received ethics approval from a subcommittee of RMIT University’s Human Research Ethics Committee.

## Data collection from G4W garden assessors

Garden assessors were a distinctive sample of participants by virtue of their role and knowledge of G4W members' motivations and properties gained during garden assessment visits. All 18 past and present garden assessors living in Melbourne were invited to participate in a group interview to discuss G4W and to help in selecting a heterogeneous sample of G4W members to interview; 13 participated. Their experience as assessors ranged from 8 years involvement in the program to one who recently commenced. At the end of the group interview, the assessors were asked to answer a brief open-ended questionnaire about their motivations for wildlife gardening and assessing members' gardens (Table 6-1). Six assessors provided written responses.

**Table 6-1. Garden assessor open-ended questionnaire**

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Reasons I started wildlife gardening

Why I continue to wildlife garden

Why I became an assessor

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Rewards and challenges I get from being involved in the program

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## Data collection from G4W members

A diverse sample of G4W members was sought for interview in order to understand commonalities in the effect that program participation has on members despite differences in their personal and situational factors, and whether there were apparent relationships between these factors and the program's effects. Garden assessors first identified features of G4W member diversity in the group interview (Appendix 6) and then independently recommended members for an interviewee sample spanning that diversity. Ten of the 32 recommended members responded to invitations and were interviewed. Another six G4W members from a subsequent invitation to 106 members from across joining years and postcodes were also interviewed. The sample was deemed suitable given the exploratory purpose of the research and the diversity of the interviewed sample (described in Findings below). Furthermore, saturation, as described by Guest *et al.* (2006: 65) "the point in data collection and analysis when new information produces little or no change to the codebook", was reached after 16 interviews in the data analysis stage of the overarching case study (Mumaw and Bekessy 2017). I incorporated prompts about wellbeing and feelings of connection with one's garden, nature, and community into the semi-structured interviews conducted with G4W members (Appendix 7, Items 12, 13, 17). The interviews took place at members' homes and in their gardens. Interviews varied in length from 45 minutes to two hours and were recorded and transcribed.

## Data analysis

I transferred responses from garden assessors to QSR NVivo software and coded them line by line. Any narrative referred to as a 'reward', or including words like 'passion', 'enjoyment', 'learning', 'connecting', 'sharing', 'joy', 'satisfaction', 'hope', 'positive feedback', and 'achievement' were included as data for this study.

I coded G4W members' interview transcripts line by line using QSR NVivo software. Codes were not pre-established but derived from members' responses. Sufficient narrative was coded to provide a context for each coded topic; if members covered a number of topics in a single response these were all separately coded. Codes and transcripts were iteratively reviewed as part of a fluid, inductive analytical process described by Charmaz (2014: 109-161) in which emergent ideas from initial coding were used to develop descriptive nodes relating to various aspects of members' responses to the program. Any material referred to as a 'reward' or including words like 'passion', 'enjoyment', 'learning', 'connecting', 'sharing', 'joy', 'satisfaction', 'hope', 'positive feedback', and 'achievement', or provided in response to wellbeing or connectedness prompts, were included as data for this study. Although interview prompts about wellbeing and feelings of connection generated rich data for this study, material related to wellbeing and connectedness emerged throughout the interviews, particularly in members' descriptions of the purpose and motivations for their wildlife gardening, and the rewards, setbacks, and challenges.

## Findings and discussion

### Demographics/characteristics of interviewed Gardens for Wildlife members

Interviewed G4W members were diverse demographically, in property features, and in G4W membership characteristics (Table 5-1 p 69). For example, they ranged in age from under 25 to over 75 years, had been members for less than six months to up to eight years, had various sized lots, and differing countries of origin and employment status.

### Wellbeing benefits

Members and garden assessors described subjective wellbeing benefits from their involvement in G4W that I categorised into four main types: experiencing nature, sharing experiences or knowledge, learning and developing skills, and making a worthwhile contribution to helping wildlife or the environment as described below.

Every G4W member, irrespective of age, years of membership, or other identified characteristics, mentioned wellbeing derived from experiencing nature, using terms like 'serenity', 'wonder' and 'rejuvenating' to describe their feelings. The most common experiences involved birds.

One explained 'Just quality of life because for us to hear the birds... and like just they'll sing, you know the little birds coming through, that gives me great joy personally' while another said 'and [you] listen to the birds and you may not see them, but it's just, you're surrounded by all this green and trees and there's that "Ah, this is wonderful" '. Some members and assessors expressed the rewards of experiencing nature's cycle, for example: 'Absolute enjoyment observing the presence of the cycle of nature', or its interactions: 'Just the enjoyment of the wildlife itself. For me a garden isn't just about the vegetation, it's the flora and the fauna. They go together... and it's interesting to watch those relationships'.

The second form of wellbeing benefits involved sharing experiences, knowledge and skills. All garden assessors received this from helping members and enjoying the interaction. One wrote 'I wanted to share what we had gained and were enjoying with other interested people', and another was rewarded by 'Seeing the pleasure locals derive from being able to recognise the wildlife garden they already have and helping them to add to it'. Some members and assessors nominated sharing their experiences with family members as motivating or rewarding, as in 'share my passion for indigenous flora and fauna with my family' or 'we have a young son with a little bit of learning difficulties...this is, you know, great for him... and my daughter, ...she's just hopped out of her skin'.

Another form of wellbeing benefits related to gaining new knowledge and skills: 'But I think the program's just given me a focus on learning and watching, and like every day there's something new to learn.' Learning and skills development was mentioned by most (11 of 16) G4W members; this generally related to the extent of their wildlife gardening activities rather than time in the program. All garden assessors enjoyed gaining new knowledge and skills, often derived from interactions with members or fellow assessors such as 'a great opportunity to listen and learn from other people' or 'It has empowered me to do other things. Write a monthly page on nature for the local Senior Cit[izen]s newsletters'.

The fourth form of expressed wellbeing benefits involved feeling pleasure from helping wildlife and its environment. All garden assessors and almost all (14 of 16) interviewed G4W members conveyed this:

It really actually physically makes a difference, and it's helping to protect the environment, and it's just improving the environment. And even though it might be little things in little ways, it's something positive in the outcomes.

and:

Gives me the sense of achievement that I am taking responsibility for the space that I live in and knowing that it belongs to a wider landscape and all those living within it rather than just myself.

Of the two exceptions, one member had not yet had a garden assessment and the other, a first-time home gardener and member for three years, intended to replace plants with indigenous species but had not yet begun.

In summary, G4W participants expressed wellbeing benefits reported in the literature that are associated with experiencing nature (Keniger et al. 2013), home gardening (Bernardini and Irvine 2007, Clayton 2007), and helping the environment (Husk et al. 2016), falling into both experienced and eudemonic forms of wellbeing. Eudemonic wellbeing refers to feelings associated with personal growth or purpose in life (Dolan et al. 2011). Fulfilment of eudemonic needs was found to independently contribute to optimal feelings of quality life, along with fulfilment of basic needs and fulfilment of social needs, in a multi-country study of subjective wellbeing (Tay and Diener 2011). The eudemonic feelings of wellbeing derived from actively contributing to nature conservation are an important social health benefit for urban residents beyond having green spaces to experience. Of key importance are Knox City and KES' endorsement of residents' contribution to conserving indigenous flora and fauna through their gardening.

### Connections with local nature, place, and community

Beyond associating feelings of wellbeing with experiencing nature and helping to conserve indigenous species, G4W members spoke separately of strengthening connections to nature as part of the place they lived. All members felt that their attachment to their gardens had grown because of their wildlife gardening:

We're deeply, deeply attached to it and connected to it now just because of, you know, when your hands are in the soil and you're doing it yourself, yeah no we feel very passionate about this property.

These feelings continued to grow:

And that grows. It's not just something you go "Yep we're connected. We're now connected with nature." That doesn't happen like that. I think for me it just keeps growing that feeling.

This attachment was also related to participants' role in helping to conserve flora and fauna. One member explained 'By our own little patch of land, we're trying to give back to the area', and another said 'It was about...putting some of the structure back in that was being lost...giving back to the

place'. This aligns with studies showing that environmental volunteers develop growing feelings for local nature and attachment to the places they regularly care for (Ryan and Grese 2005, Husk et al. 2016). Findings also align with studies in rural environments reporting that these places are mediums for personal learning and growth, and that people make strong emotional, spiritual, and restorative connections with place through experiencing and managing the land (Carr 2002, Rogan et al. 2005).

Lewicka (2011), in her review of place attachment research, concludes that place is an object of strong attachment, and that there is a correlation between strength of place attachment and ties with community, although how and why this occurs remains poorly understood. Most interviewed G4W members felt that participation in the G4W program had improved their connection with Knox City, primarily through the personal relationships and trust they had developed with Knox G4W program staff. While members appreciated Knox City's habitat protection and improvement work and support of G4W, they wanted Knox City to be a better role model, promote the program more visibly and widely, and engage more community members in it. One summarised 'I think the program's terrific... So that gives me a good feeling about Knox Council even though I think they probably need to do something more with the program.'

In terms of social connections, assessors enjoyed interacting with members and other assessors, a feature of their role. While few of the interviewed G4W members had face-to-face interactions with other members, they appreciated and felt some connection to them in working to a shared purpose: 'I guess I like to think of the little tentacles out there, you know, I like to think of that.' Some G4W members felt strong connections with other community members at the KES nursery, expressing their feelings with great intensity and conveying a strong sense of hope about the future and pride in their community:

I just get a buzz out of going down to the indig nursery... like the people are fantastic you go down and you think like, gosh Knox is actually great, you know, it makes you feel good about your neighbourhood and the people around and it's not all bad and the world's not bad. There's people that are doing the positive things.

Invariably I get energised by these people – their attitude and what they want to do, it's so energising and refreshing for me. I start thinking "oh no, the world's coming to an end" and then you go out and actually see the willingness of people to make a difference within their own world, and just like me, control what they can control. I come back refreshed again and feeling more positive.

This feeling of hope in common purpose and work was also expressed by several assessors, for example 'hope for the future when you see what people are doing on a personal basis'.



It is worth noting the importance of hope, not only from a wellbeing perspective but also with respect to conservation. Quimby and Angeli (2011) found that environmentalists considered low-efficacy of their behaviour the most significant barrier to living in an environmentally friendly manner and concluded that catalysts for invigorating environmentalists include feelings of efficacy, empowerment, and a greater sense of hope. The importance of hope in motivating and sustaining professionals in conservation and ecological restoration has also been noted (Hobbs 2013). These findings highlight that there is opportunity to engender hope and involvement in nature conservation by urban residents through participatory municipal conservation programs.

In summary, participants not only identified experiential and eudemonic qualities of wellbeing from their participation in G4W but also spoke of strengthened connections with place, local nature and community. Underpinning these results are the program's social features, including face-to-face interaction with council and community group members in residents' gardens and at community hubs, and importantly, the evidence of council and community members working to a shared purpose of municipal conservation.

### Implications for development and assessment of urban nature conservation programs

Evaluation of conservation programs generally focuses on biodiversity outcomes (Stem et al. 2005, Kapos et al. 2009). Where the effects of conservation programs on human wellbeing outcomes are assessed, this usually involves assessing changes to access to resources or the provision of income-generating activities or economic incentives (Kapos et al. 2009, Mcshane et al. 2011). However, increasingly there have been calls to consider subjective personal wellbeing in such evaluations, that is, aspects of life that community members themselves value (Woodhouse et al. 2015), "meeting [their] needs, pursuing [their] goals, and experiencing a satisfactory quality of life" (Milner-Gulland et al. 2014: 1160). Subjective wellbeing and generation of connections to community or place are rarely used as performance measures for conservation programs in developed countries, particularly in urban environments. There is a risk that in failing to capture wellbeing or community building outcomes from these programs that their contributions will be undervalued by funding agencies and government bodies (Robins and Kanowski 2011).

The social connections and wellbeing benefits reported by G4W participants were linked to their involvement in conserving indigenous species of the municipality. We recommend using a Venn Diagram (Fig 6-2a) to depict the potential community, personal, and biodiversity benefits of various nature conservation goals because it illustrates that conserving biodiversity does not have to be at the expense of human wellbeing or vice versa. It draws attention to the possibility of deriving mutual or synergistic benefits to both humans and biodiversity from conservation activities, and therefore the importance of considering how to develop and maximise these opportunities. Using a

spectrum, with potential human and biodiversity benefits on two opposite ends (Dearborn and Kark 2010) (Fig. 6-2b), can imply a dichotomy between benefits to humans and benefits to biodiversity, and does not easily allow for placement of a goal or program that *both* connects with people with nature *and* engages them in protecting species.

**Figure 6-2. Conservation goals and their benefits**

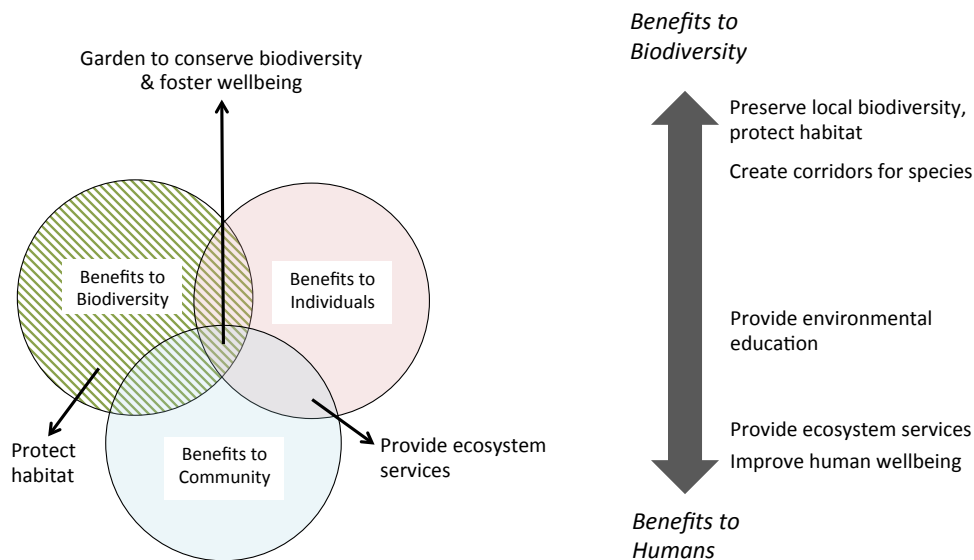


Fig 2a. Goals mapped on Benefits Venn Diagram

Fig 2b. Goals mapped on Benefits Spectrum  
Adapted from Dearborn & Kark, 2010:3

The dangers of glibly promoting ‘win-win’ opportunities for both biodiversity conservation and human wellbeing have been pointed out, particularly in the international development context, when assessments of social and ecological benefits are measured at scales and in ways that do not capture the complexities and trade-offs that are occurring at the finer grain of individuals, species and place, or over longer scales of time (Mcshane et al. 2011). That is not the intent here – rather, it is to stimulate a discussion about how to develop meaningful opportunities for people, particularly in cities, to connect with nature and actively care for their biodiversity while maintaining or even improving their quality of life.

Conservation practitioners have reported that stewardship can provide ‘enrichment of personal and public life through conjoined conserving, reconnecting to place, and social networking’ (Diamant et al. 2003: 317). Mitchell and Brown (2003: 305) conclude that ‘Stewardship helps to build civil society by giving people opportunities to participate in shaping their environment and, therefore, their lives’. Diamant et al. (2003: 318) recommend ‘a fundamental rethink’ of how to measure success in land conservation work by including personal self-fulfillment and community

building, noting that land conservation and social capital are interdependent. They quote from a speech by Gus Speth, former Dean of Yale School of Forestry and Environmental Studies:

We broke things down to the component parts and laid out rational plans of attack...now we know the most important resource is human motivation – hope, caring, our feelings about nature and our fellow human beings. Diamant et al. (2003: 317)

Urban residents are often disconnected from conservation, seen as the province of experts (Adams and Mulligan 2003). Findings from this study reaffirm the opportunities urban nature conservation programs offer to engage residents and to improve community wellbeing when embedded in interactive social contexts in which local government and community work to a shared purpose. They also point to the importance of planning for and valuing these benefits.

This qualitative, exploratory study offers insights that are context dependent and cannot be generalised or directly transferred to other populations. Nonetheless, the wellbeing benefits found from program participation add to a body of evidence that experiences in and with nature can contribute to various forms of wellbeing, and that participating in conservation provides additional eudemonic benefits also found in environmental volunteering. The potential opportunity to strengthen urban community linkages *while* caring for local nature merits further testing of these findings from the broader G4W population and in other similar programs, both qualitatively and quantitatively.

## Conclusion

Conserving biodiversity and advancing wellbeing are goals usually siloed in urban government environment or health portfolios. This study provides compelling evidence that urban residents derive wellbeing and connections with nature, place, and community from participating in a nature conservation program carried out as a local government-community group partnership that endorses the importance of their gardening to conservation of the municipality's flora and fauna. Wellbeing benefits are experiential, social, and eudemonic – each types of wellbeing that independently contribute to quality of life. My findings indicate that opportunities to engage urban landholders in gardening to support municipal conservation may be currently undervalued and should be explored as a complement to other urban conservation activities. Wellbeing and social benefits from community conservation programs should be pursued and evaluated to understand this phenomenon better.

## 7 THE CRITICAL ROLE OF COMMUNITY CAPACITY FOR URBAN CONSERVATION

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*The top down would have seen it very much as a feel good program ... whereas the people coming pushing it have turned it into something real, pushing it from the ground up.*

Knox Environment Society co-founder, Gardens for Wildlife, 2014

### Abstract

Conserving native biodiversity in cities fundamentally depends on their communities protecting and improving habitat across mosaics of land with different forms of tenure and land management. Developing integrated strategies that foster biodiversity while improving human wellbeing is increasingly called for, but little understood. Here I explain the critical role of community capacity and develop a systems-based framework for representing social and ecological components that comprise its application to biodiversity conservation. This framework can be used to consider the impact of programs (either post-hoc or ex-ante) on strengthening a community's ability to achieve both conservation and wellbeing outcomes. I apply the framework to an urban wildlife gardening program in Melbourne Australia and demonstrate its utility in identifying elements of success and areas for reinforcement or improvement. Data are derived from a member survey and interviews with 32 individuals involved with the program, including founders, members, volunteers, council staff, and community group leaders. The program strengthened the community's social and ecological resources for conservation and their deployment in conservation activities, particularly through involvement of residents. Tangible co-contributions from the community and local government supported residential participation, social connections, and wellbeing. Potential improvements include fostering already successful attributes like collaborative governance between Council and community group, planning for specific ecological impacts through coordinated private and public land management, and strengthening complementarity with other Council programs. For conservation in cities, using community capacity assessment frameworks can highlight previously unknown or poorly considered social benefits that conservation programs can provide, and conversely, how previously overlooked community members, groups and institutions can be engaged to foster biodiversity with wellbeing benefits.

### Introduction

Increasingly conservation attention is directed to urban landscapes in which there is growing evidence that populations of native species persist (Aronson et al. 2014) and can be maintained, albeit in novel ecosystems (Kowarik 2011, Ellis et al. 2012, Standish et al. 2013). In populated areas, communities are both enactors (or potential enactors) of conservation programs, and the recipients

of their impacts (Berkes 2004, Ban et al. 2013), which may affect their lifestyles, livelihoods or cultural practices positively or negatively. There are growing calls to integrate goals for human and community wellbeing with those for conservation of biodiversity (Mcshane et al. 2011, Milner-Gulland et al. 2014), and that urban nature conservation ‘can contribute to sustainable cities by delivering co-benefits to human and non-human components of biodiversity’ (Shwartz et al. 2014: 39).

The potential for many forms of land and landholders to contribute to biodiversity goals in cities is often poorly recognised (Ernstson et al. 2010), with municipal initiatives for residents directed towards nature education and experiences rather than conservation practices (Hall et al. 2017). Yet conserving biodiversity in urban landscapes will require residents and organisations acting together to improve habitats across a landscape (Colding 2007, Ernstson et al. 2010). Multiple engagement and land use strategies are required that reflect the degree, type of human activity, and relationships people have with their biotic communities (Martin et al. 2014, Chan et al. 2016). Central to the process are social learning, developing a shared language and values for biodiversity conservation (Norton 2005, Maris and Béchet 2010), finding ways of working productively together (Metcalf et al. 2015), and adapting methods through doing (Bouwen and Taillieu 2004, Berkes 2009).

The challenge for policy makers and practitioners is how to develop, assess, and improve conservation work embedded in urban communities (Shwartz et al. 2014). Conservation solutions are often unclear, and meaningful time-bound performance indicators can be difficult to establish because socio-ecological systems are complex and dynamic, operating at different time and spatial scales (Folke et al. 2007) with ill-defined boundaries and unknown feedback loops (Game et al. 2014). Many conservation approaches and tools are not well suited to this complexity (Game et al. 2014), and there are no definitive conservation program planning or evaluation methodologies (Stem et al. 2005, Bottrill and Pressey 2012). While a community’s ability to address its biodiversity conservation and wellbeing challenges is critical for long term success, I believe that community capacity is undervalued, under-assessed, and under-reported in the development or assessment of conservation programs, particularly in urban settings.

Here I propose a framework for assessing urban conservation programs that suits the socio-ecological context, derived from the concept of community capacity building. I begin with a brief overview of parameters used to evaluate conservation programs, provide a rationale for the use of a community capacity building approach, and describe the proposed framework. I then apply the framework to a case study – an urban biodiversity conservation program run by a community-local government partnership in Melbourne Australia. I discuss the findings and their implications for urban biodiversity conservation.

## Conservation program evaluation

Traditionally, conservation programs have focused on ecological measures only (Kapos et al. 2009, Bottrill and Pressey 2012), related to increasing the probability of persistence of native ecosystems, habitats, species, and/or populations in situ (Kapos et al. 2008). These biodiversity outcomes, and associated interim performance indicators, are particularly challenging to measure or track. Amongst the difficulties are the time periods required to observe change (Kapos et al. 2008, Bottrill et al. 2011); the lack of clarity about inputs, outputs, outcomes, long term impacts and the relationship between them (Bottrill and Pressey 2012); and lack of baseline data (Bottrill et al. 2011).

Increasingly, social considerations are being integrated into conservation planning, for example using spatial data on human preferences (Whitehead et al. 2014) and community priorities to target conservation opportunities (Ban et al. 2013). Likewise, conservation program evaluation is including social factors deemed to enable better biodiversity outcomes (Moore et al. 2006b, Kapos et al. 2009). Bottrill and Pressey (2012) propose using forms of social capital (eg frequency and type of conservation agency collaborations, level of biodiversity conservation knowledge) to measure efficacy of conservation planning investment. While there is no consistent evidence that having forms of capital indicative of capacity to carry out biodiversity conservation necessarily leads to species persistence (Moore et al. 2006b), they have been posited as more likely indicators of success than resources expended because they lead to more and/or better actions to address conservation challenges (Kapos et al. 2009, Mountjoy et al. 2013b). Examples of these capacity indicators are shown in Table 7-1, p 103 (Moore et al. 2006b, Kapos et al. 2009, Mountjoy et al. 2013a). In these reports, the ways these forms of capital were or could be better actioned for conservation are not discussed. Social elements are treated as inputs rather than potential benefits and community wellbeing is not identified as a targeted end-outcome.

More recently, systems frameworks that identify social and ecological factors that benefit both biodiversity and human communities have been proposed to evaluate and plan conservation programs (Ban et al. 2013). Mitchell and Brown (2003: 311) contend that the focus should shift towards conservation process rather than ‘specific, prescribed outcomes’ because:

Conservation evolves...our ideas about the objectives and even the goals of conservation change as well. We will always be ‘practicing’ conservation to get it right because what we believe to be “right” is a moving target.

Participating in the conservation process is required to develop the social relationships and interactions that can enable it to happen (Bouwen and Taillieu 2004), and to learn what we want and ‘what it might be possible for us to have’, in a world where embarking on actions sets in train new

trajectories for us to deal with (Bromley 2012: 1). Similarly, literature on engaging the public in living sustainably or addressing climate change advises using tools that encourage a systems approach and build competencies in systems and futures thinking, interpersonal skills, and problem solving (Wiek et al. 2011). Other recommendations are to assess process as well as short and long term outcomes, involve various social actors, use collaborative forms of governance, and develop capacity to respond to future challenges (Whitmarsh et al. 2012), including individual and organisational capacity to share knowledge and test ways of collaborating (Vare and Scott 2007, Barth and Michelsen 2013). This literature points to the critical role of community involvement and capacity to achieve biodiversity conservation, and the need for tools to assess and strengthen them.

**Table 7-1. Indicators of community capacity for biodiversity conservation**

Natural Capital	Social Capital	Human Capital	Institutional Capital	Economic Capital
<ul style="list-style-type: none"> <li>• Extant biodiversity values<sup>1</sup></li> <li>• Natural biodiversity in nurseries<sup>1</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Trust, respect<sup>1,2</sup></li> <li>• Shared values, mutual interests<sup>1,2</sup></li> <li>• Motivation<sup>1</sup></li> <li>• Sense of Place<sup>1</sup></li> <li>• Outreach, education<sup>2</sup></li> <li>• Networks<sup>1</sup></li> <li>• Staff and volunteers<sup>2</sup></li> <li>• Relationships<sup>1</sup></li> <li>• Marketing<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge<sup>1,2</sup></li> <li>• Skills<sup>1,2,3</sup></li> <li>• Experience<sup>1</sup></li> <li>• Commitment<sup>1</sup></li> <li>• Motivation<sup>2</sup></li> <li>• Leadership<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Governance arrangements<sup>1</sup></li> <li>• Plan<sup>2</sup></li> <li>• Communication<sup>2</sup></li> <li>• Enabling support<sup>3</sup></li> <li>• Understanding<sup>3</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Financial resources<sup>1,2</sup></li> <li>• Equipment, supplies<sup>2</sup></li> </ul>

<sup>1</sup>Moore et al. 2006b, <sup>2</sup>Mountjoy et al. 2013a, <sup>3</sup>Kapos et al. 2009

## Rationale for a community capacity building approach

The concept of community capacity building is variously defined but is commonly systems-based, involving mobilising forms of capital that comprise capacity in an iterative, interactive process for the benefit of the community (Simmons et al. 2011). There are three features inherent in concepts of community capacity building that suit it as a framework for evaluating community conservation programs: 1) the inclusion of *social actors and their interactions* as elements of community capacity; 2) the notion that community capacity is an *outcome as well as a means* of capacity building and 3) reference to the *process* of effectively deploying forms of capital (Mendis-Millard and Reed 2007, Wendel et al. 2009, Simmons et al. 2011). One of the seminal definitions of community capacity comes from Robert Chaskin (2001: 295), who used it to evaluate urban social change initiatives:

Community capacity is the interaction of human capital, organizational resources, and social capital existing within a given community that can be leveraged to solve collective problems and improve or maintain the wellbeing of a given community.

What particularly appeals in Chaskin's (2001) definition is his articulation of community wellbeing as a desired outcome. A capacity building framework can focus attention on how a community conservation program is improving a community's ability to address its biodiversity conservation and wellbeing issues in an integrated way. This ability can be adjusted and deployed to suit the changing challenges and circumstances characteristic of urban biodiversity conservation (for example, shifting attention to different species or habitats).

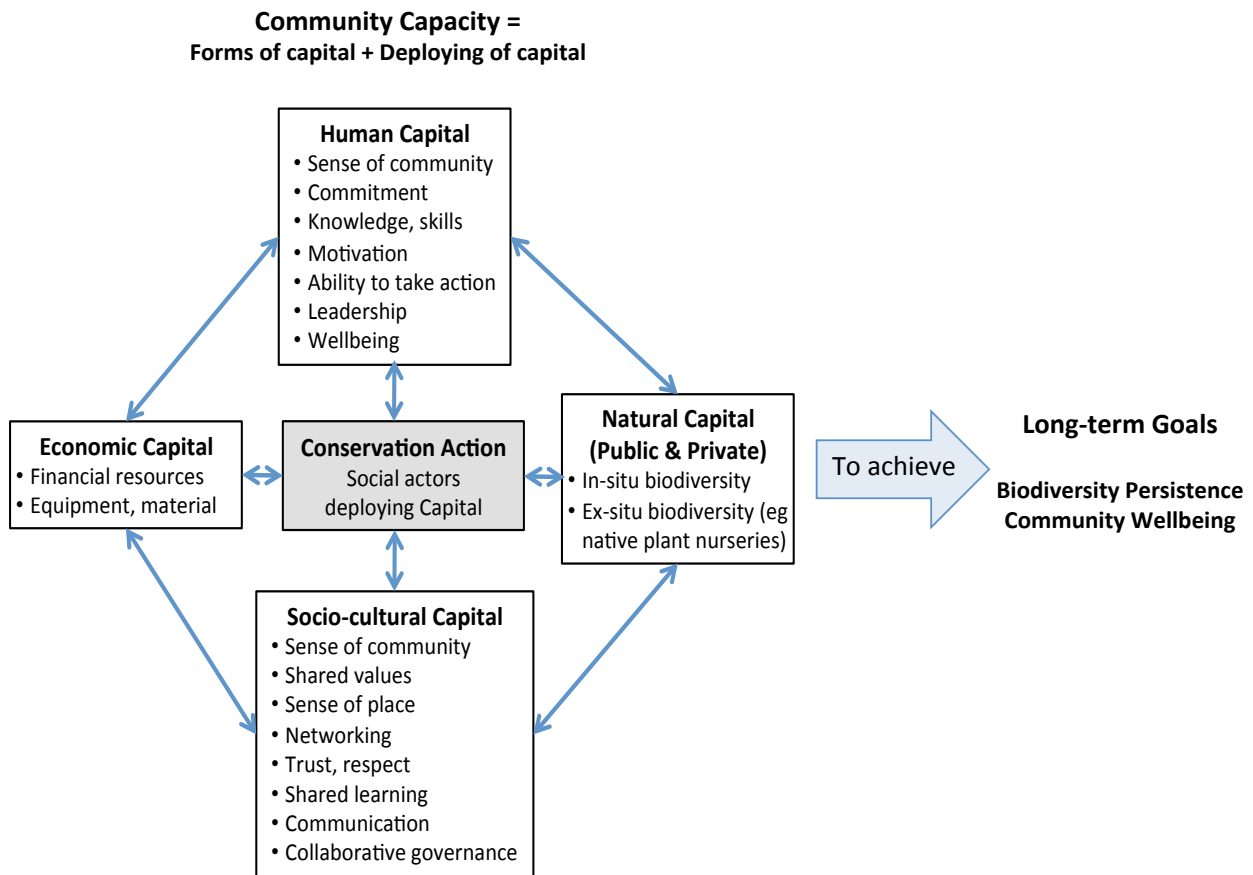
## Community capacity building framework

There are few capacity building frameworks illustrated in the literature. Reasons for this include that the process of capacity building is inherently complex, and there are differing definitions, contexts and purposes for the capacity building, as well as for the use of such a framework.

To develop a community capacity building framework for conservation program assessment (Fig 7-1, p 105), I first nominated two long-term goals for conservation programs (shown on the far right): native biodiversity persistence and community wellbeing. I then used a 5-block diamond to represent community capacity, the ability of the community to achieve the long-term goals: four categories of capital (human, socio-cultural, economic, natural) and in the shaded centre, the deployment of these forms of capital in conservation action. For simplicity the framework does not illustrate the finer-grained feedback loops that happen between capacity elements and processes over time, nor the potential non-linear aspects of change. The framework includes some features developed by Mendis-Millard and Reed (2007) for community-based ecosystem management but differs in several ways, including adding capital deployment as a category of community capacity and nominating community wellbeing as a desired goal. I have populated the categories of capital with elements indicative of program success (capacity indicators), drawn from the community capacity and conservation literature (Fig 7-1 footnote 1). These are not exhaustive; the importance of specific elements will depend on the context.



**Fig 7-1. Community capacity assessment framework showing capacity elements indicative of success derived from the conservation and community health literature<sup>1</sup>**



<sup>1</sup>from Moore et al. 2006b, Ansell and Gash 2008, Wendel et al. 2009, Kapos et al. 2009, Simmons et al. 2011, Sandoval et al. 2012, Mountjoy et al. 2013a

The framework is intended for design and/or post-hoc assessment of conservation programs operating at the scale of a local community. Users can populate the blocks of the framework with attributes relevant to their own programs and context. The capacity indicators are provided as a guide (recognising that they too are subject to testing). If the objective is program design, capacity elements can be set as goals for program strategies. If post-hoc program assessment is the aim, the presence of desired capacity features or changes in them over a particular time period can be used to appraise program value and consider improvements. Assessment should be undertaken with an eye to reviewing a program’s goals, strategies, and governance. Ideally this would be part of a recursive improvement approach (Benvie 2005, CMP Conservation Measures Partnership 2007) that considers the context including other extant conservation or wellbeing programs, medium-term aims for biodiversity conservation and community wellbeing, and monitoring methods.

The benefits of the framework include: 1) recognising the role of diverse community actors; 2) encouraging a systems approach; 3) incorporating social as well as ecological measures and long-term goals of wellbeing *and* biodiversity persistence; 4) addressing the dynamism of both the operating

environment and process of conservation by focusing on changes in a community's ability and actions to achieve long-term goals.

## Applying the framework to a case study

In this section I apply the community capacity building framework to an urban case study - the Knox Gardens for Wildlife program (G4W) (Knox City Council 2016d). I begin with an overview of Knox municipality and the G4W program. I explain how data used for the framework analysis was procured. Then, using the framework as an organising structure, I assess how the program strengthens community capacity and its deployment to conserving biodiversity conservation and improving wellbeing, concluding with the outcomes of using a community capacity assessment.

### Case study background

#### *Knox municipality*

Knox municipality is located about 25 km southeast of the Melbourne CBD and covers 114 square kilometres, with approximately 154,000 residents and 58,000 homes. Over the last 30 years the municipality has gone through a period of rapid housing growth and business development. It has a similar socio-demographic profile to the general Australian population but has more couples with children (40% vs 31%) and residents living in separate houses (87% vs 74%) (.id 2016).

Almost a quarter of Knox is covered by tree canopy (Jacobs et al. 2014) and there are national parks on its eastern and southern boundaries. The dominant native vegetation is open eucalypt forest and scrub bushland (Knox City Council 2015b). A study mapped 118 sites of biological significance (Lorimer 2010b), noting that a significant proportion of Knox fauna species are listed as threatened or near-threatened in Victoria. Eighty-four per cent of indigenous plant species are locally threatened with 41% critically so. While all of the threatened vegetation habitats were represented in conservation reserves managed by Knox City Council (Council), threatened plant species were also found on publicly owned sites including schools and roadsides and on private residential land (Lorimer 2010b).

Council's strategies for protecting and enhancing its natural habitats include managing bushland reserves; planting indigenous species; increasing the network of indigenous habitat corridors and waterways; putting regulatory overlays in place that support the quality of biologically significant sites; and supporting community participation in reserve management, and habitat retention and improvement on private land through programs like G4W (pers. comm. Gaskell 2015, Knox City Council 2008).

### *Gardens for Wildlife*

G4W began in 2006 as an informal collaboration between Council and the Knox Environment Society (KES), a community group that supports Knox's environment and reports a close working relationship with Council on its environmental activities (Knox Environment Society 2015a). KES runs an indigenous plant nursery with volunteers involved in collecting seed and propagating indigenous plants.

Council has responsibility for administrative coordination of the G4W program. KES provides indigenous plants and environmental volunteering opportunities. Together, Council and KES promote G4W and provide garden assessments and specialist advice.

G4W has a demographically diverse and growing membership of over 600 households. Knox residents join G4W by signing up. Garden assessors visit the new member's garden, explain the program's purpose, identify environmental weeds and indigenous biota in the garden, and suggest gardening activities to help conserve the municipality's indigenous biodiversity. Members receive a written assessment report, vouchers for 20 free KES nursery plants, newsletters, and invitations to G4W events.

### *Data used for framework assessment*

Data used in the framework assessment comes from research on G4W as a 'revelatory' case study (Yin 2009: 48-49) of an urban conservation collaboration involving residents to foster indigenous biodiversity on their land. The research focused on G4W's social and ecological goals and impact. Thirty-two individuals involved with G4W participated in the research between 2014 and 2015. Data collection and analytical methods are summarised in Table 7-2 (p 108); further details are available as footnoted.

**Table 7-2. Data sought, informants, and methods used to generate findings for framework analysis**

Data Sought	Informants <sup>1</sup>	Collection method	Analytical method	Findings used in framework analysis
<b>G4W features &amp; background</b>				
Case study features, procedures, social and ecological context	G4W coordinators (3); founders (2)	Open-ended interviews  Web and document review	Review interviews, material provided  -	Background information
<b>Impact of participation on G4W members</b>				
Attributes of interviewees & their properties	G4W members (16) – diverse sample selected with help of garden assessors	Demographic questionnaire  Observations of gardens, lot size from web	Categorise data	How members are engaged in wildlife gardening <sup>2</sup> ; stewardship development <sup>3</sup> ; wellbeing and social connections <sup>4</sup>
Impact of G4W on members' gardening purpose and practice, wellbeing and connections with place, nature and community		Semi-structured interviews in members' gardens	Inductive, iterative analysis of interview transcripts using codes derived from participants' responses with assistance of NVivo	
Wildlife gardening activities of members			Quantitative analysis of responses to close-ended questions	How members are engaged in wildlife gardening <sup>2</sup>
Usefulness of G4W features; suggestions for improvement		Knox City unpublished survey of G4W membership	Review responses to open-ended questions, categorise using NVivo	
<b>Impact of G4W program (garden assessor perspective)</b>				
Personal impact of participation in G4W on wellbeing and connections	G4W garden assessors (5)	Open-ended questionnaire	Categorise responses aligned with wellbeing concepts and about connections with place, nature and community	Wellbeing and social connections <sup>4</sup>
Diversity of G4W members; experiences with G4W	G4W garden assessors (13)	Group interview	Review group interview transcript	Community capacity building
<b>Perceived G4W goals and achievements</b>				
incl history, purpose, strategies, social and ecological contributions	G4W founders (2); coordinators (3); KES office-holders (2); Knox managers (3)	Semi-structured interviews	Review interview transcripts, categorise responses with assistance of NVivo software	Community capacity building

<sup>1</sup>Informant numbers total more than 32 because four informants participated in more than one role

<sup>2</sup>Mumaw and Bekessy 2017 - Chapter 4

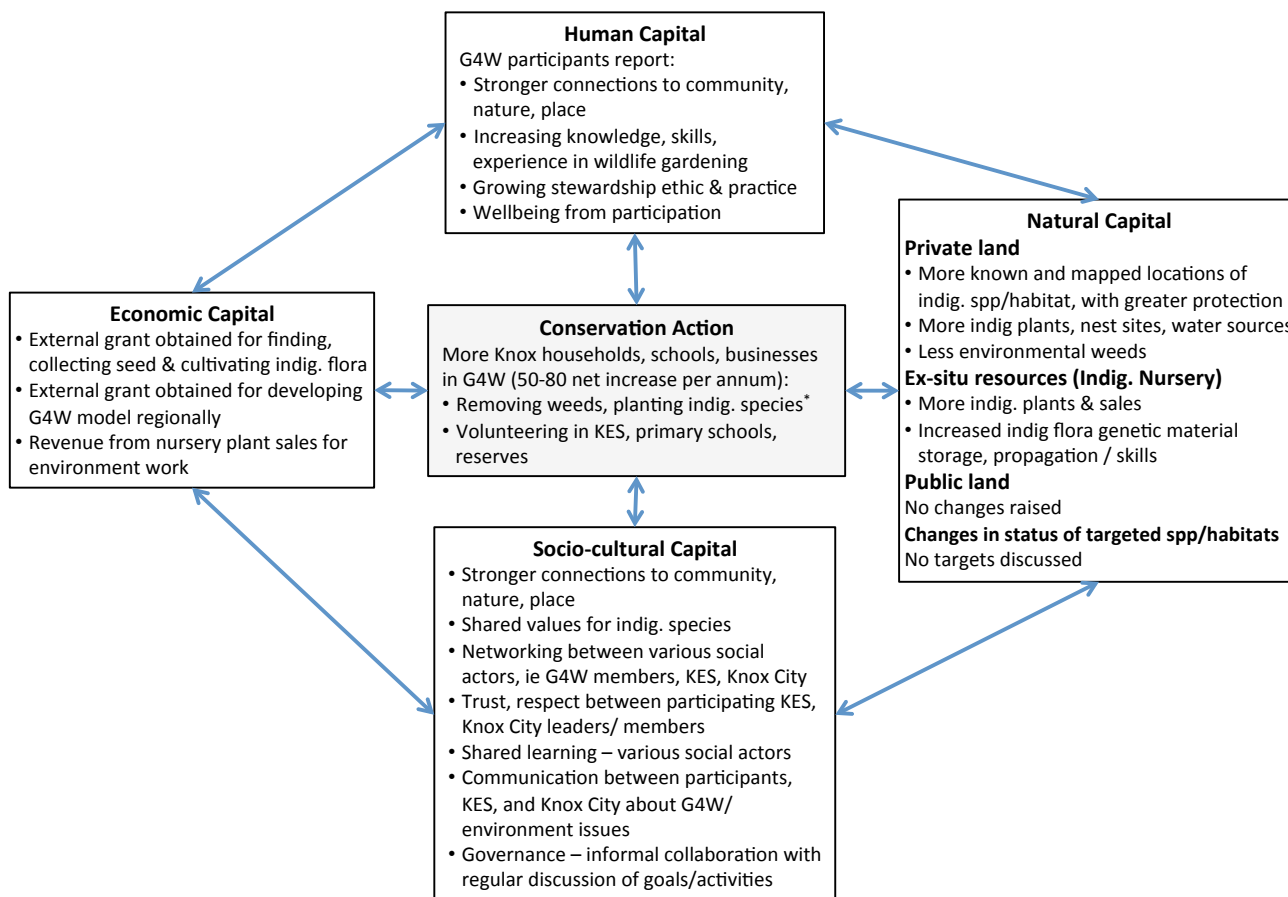
<sup>3</sup>Mumaw 2017 - Chapter 5

<sup>4</sup>Mumaw et al. 2017 - Chapter 6

## Assessment results

We put the research findings into our framework's categories of capital (human, natural, socio-cultural, economic) and conservation action to understand the impacts of G4W on community capacity. An overview is presented in Figure 7-2. Findings are discussed in detail below, organised by framework categories and preceded by a description of G4W's development and governance to provide context.

**Figure 7-2. Impact of G4W from a community capacity perspective**



### *G4W's development and governance*

G4W was founded when two KES members approached Council biodiversity staff to use the program to encourage residents to value and help conserve indigenous biodiversity. A Council founder related:

It was a way that we could potentially influence residents that lived around reserves, [to improve habitat] and ... we could increase corridors... introducing the community to biodiversity and the concept of the value of biodiversity. It was a way of getting people to connect to the natural environment through their own space.

A KES founder explained the importance of community involvement:

If things are pushed from the ground up they often work a lot better than when they come from the top down because the top down [Council] would have seen it very much as a feel good program, that was perhaps paying a little bit of lip service [to conservation], whereas the people coming pushing it have turned it into something real, pushing it from the ground up.

With limited financial resources the founders worked together to implement the program organically, celebrating ‘small wins’:

She [Council co-founder] said ... if we get 6 people to join up in the first year ladies, don't get too excited, that will be seen as a success and we will continue. And they got 100 in the first year.

A collaborative partnership developed, as one Council founder noted:

The relationship between Council and KES has become much more of a partnership focus. But I think the program has done that. It's developed a trust...we work together on programs and objectives that we want to achieve as a partnership, that's been a fantastic thing.

The founders developed trust, shared understanding, a commitment to continue, and regular program planning. Council and KES program leaders link local community knowledge with agency management/scientific expertise. These are qualities deemed critical for successful collaboration between agencies and stakeholders (Bouwen and Taillieu 2004, Ansell and Gash 2008), and for effective environmental stewardship in cities (Bodin et al. 2006, Andersson et al. 2014).

### *Human capital*

Informants spoke of improvements in human capital that primarily involved members' increasing knowledge, skills and experience in wildlife gardening, and stronger connections to nature, community, and place (Mumaw 2017 – Chapter 5). Members and garden assessors reported subjective wellbeing benefits from participating in G4W associated with experiencing nature, sharing experiences and knowledge, learning, and making a worthwhile contribution to wildlife and the environment (Mumaw et al. 2017 - Chapter 6). These outcomes were linked to G4W's interactive features, the visible involvement of local government and community and their endorsement of the conservation value of members' gardening, and learning by doing (Mumaw and Bekessy 2017 – Chapter 4, Mumaw 2017 – Chapter 5, Mumaw et al. 2017 – Chapter 6). The growth in wildlife

gardening knowledge, competence, and confidence built capacity for community conservation action. The reported personal wellbeing benefits from participation in G4W point to an urban conservation approach that can deliver integrated ecological and wellbeing outcomes.

### *Socio-cultural capital*

Strengthening of social capital was reported in the development of new linkages between a number of the social actors involved (Mumaw et al. 2017 – Chapter 6), growing trust and respect, and appreciation of different parties' contributions to conservation. A Council G4W coordinator noted:

The messages coming from KES are probably stronger than the messages that come from us, because they're coming from a community group as opposed to an authoritative government figure.

However this person also said that G4W members rang Council staff to talk about wildlife in their gardens, felt Council wanted to hear from them, and that Council was 'pro-environment' in terms of the program. A KES office holder noted the opportunity to build relationships about and for the environment through G4W planning and events.

Both G4W members and KES officers remarked on the importance of seeing others volunteer to help the environment:

People come here [KES nursery] and they cannot believe it's run by volunteers... People need to feel safe and that's a safe spot in their world, that people are still doing things because they value them... for the sheer good of it. KES officer

It is a community nursery...[run by] volunteers. It's not a commercial operation which is another thing that has attraction to me. G4W member

The strengthened social capital, including connections between community members and Council and the shared learning between them, related to participating jointly in a program to conserve municipal indigenous biodiversity and social interactions between the parties (Mumaw and Bekessy 2017 – Chapter 4, Mumaw 2017 – Chapter 5, Mumaw et al. 2017 – Chapter 6). Understanding what social capital has been developed provides a basis for considering how to harness it to improve particular habitats or ecosystems, or provide opportunities for community members to feel socially connected. For example, garden assessors reported that they encountered members who had joined because of an illness and felt reconnected with nature and/or community as a result of participation:

I was seeing a lot of people joining the program who joined at a time when they were ill...people who had either had a life threatening illness or were retiring from work because they had an illness ... and want[ed] to reconnect with nature.

### *Natural capital*

A Knox manager explained that Council's understanding of its natural capital began 20 to 30 years previously:

It was both members of Council and members of the Knox Environment Society, members of the community, trying to understand what we had...of remnant vegetation, indigenous vegetation...and being pretty well shocked by how much weed degradation there was.

This led to a study of the biologically significant sites in Knox, and the development of Council-led management plans for a number of reserves. Importantly, it also led to understanding that there were significant vegetation on privately owned sites and 'trying to get people to take a little bit of stewardship over their land, particularly when it contained this remnant vegetation'. The G4W program is viewed as part of this effort. G4W-related improvements in natural capital were reported for private land through members' removal of environmental weeds and planting of indigenous species (Mumaw and Bekessy 2017 - Chapter 4). Council informants reported identifying and mapping previously unknown occurrences of indigenous species or remnant vegetation on G4W members' properties, and donation of conservation-significant land to Council by some G4W members. KES and its nursery supported improvements in both ex-situ genetic material and propagation skills for indigenous plant species. KES officers reported securing a grant to locate threatened indigenous floral species, and to collect, store and propagate genetic material:

It's our job to try and find the ones on the list, whether they're either at the places they've been recorded in the past, or, to find new populations of them, and we either collect cuttings or seed or the plants themselves if they're in mortal danger, and then we try and grow them, and then through Knox Council, put them back into various reserves.

No species- or habitat-specific G4W conservation or monitoring strategies were raised jointly considering G4W member and Council managed land, but one Council manager noted 'I'd like to think that every 10 years, we would review how are we tracking in terms of our remnant vegetation on private land and on public land' as a desirable monitoring strategy. This points to opportunities to



develop specific targets and strategies for complementary public/private conservation land management.

### *Economic capital*

Three contributions of economic capital generated by G4W were mentioned: two external grants obtained for related activities and revenue procured from growth in indigenous plant sales. A KES office holder noted 'we've got ourselves a 50% increase [in plant sales] over the last 2 years here at this nursery, well a factor of 4 or 5 over the 5 year period'. This was attributed in part to G4W although there was not a system in place to track whether sales were made to G4W members. Like most other forms of capital measures I used in the framework, economic outcomes from G4W were not formally tracked or measured and what was discussed in interviews may not represent the full extent of the program's impact. There are also potential indirect benefits, for example, reduced demand on the health system.

### *Conservation action*

This category of the framework represents deployment of human, social, natural, and economic capital in conservation actions, which themselves build further capital for fostering biodiversity and wellbeing. Council records show increasing numbers of residents becoming G4W members year on year. All interviewed members had planted indigenous species and all but one had removed environmental weeds and this level of action was endorsed by findings from the 2009 member survey (with a 42% response rate) (Mumaw and Bekessy 2017 - Chapter 4). Ninety-six per cent of survey respondents reported planting indigenous species and 88% removing environmental weeds. Some garden assessors and G4W members reported bringing wildlife gardening into their children's or extended family members' schools and pre-schools, volunteering in Council reserves, or joining KES and participating in seed collection and plant propagation:

It's been good for us as a family because I've been able to introduce [young son] to the nursery...he came out seed collecting so then he learns how it works, how a plant actually reproduces and how you collect seed, and that's been important for us as well.

Council informants noted that the involvement of families, young children, and new immigrants was a positive indicator of building capacity for future conservation action and represented a broader demographic than is typical for their conservation programs.

### *Outcomes of using a community capacity assessment*

The community capacity framework assessment shows that G4W stimulated gains in human capital (conservation knowledge, skills and motivation, and wellbeing), social capital (social links,

communication, shared values and learning), natural capital (knowledge of biologically significant sites, improved habitat quality on private land, ex-situ biodiversity resources) economic capital (grants and revenue from plant sales) and increased conservation action. These factors interact, characteristic of dynamic socio-ecological systems (Ban et al. 2013), for example, participation in G4W conservation action builds human and social capital for conservation and personal wellbeing. Many of these factors had not been used to assess G4W. Founders reported that initially there were no formal G4W performance measures, other than tracking membership growth and attendance at program events. Over time, G4W managers and KES office holders began to notice and appreciate the social connections and shared biodiversity values being generated by the program:

The social connections ... [were] never an intended outcome, so that was just something that I'm still amazed by... people really have enjoyed finding others that have similar values... it's made [the nursery] a community hub. Like, people go there now, not just because of plants, they go there for those social connections.

A Council manager noted that social measures were now being considered as performance indicators for G4W including its community partnership qualities and wellbeing outcomes:

Do people feel better connected to their community, do they feel engaged with what's going on, connected with people, do they feel engaged with the political aspects of the society they live in. Those sorts of things moving forward are the things I think we should be measuring in addition to the biodiversity outcomes that the program is trying to achieve... we're writing a discussion paper for Council on the connection between biodiversity and community health and wellbeing, to help them understand.

While G4W was valued for both ecological and social reasons by different actors, there were not yet formal policy or measurement mechanisms to assess these outcomes, potentially resulting in undervaluation of the program's social and ecological impacts, limited understanding of their interrelationships and how they might be supported or enhanced, and lack of awareness as to where improvements could be made. The community capacity framework provides one way of considering the inter-relationship of a program's ecological and social inputs and benefits, including potential areas for improvement. The G4W assessment pointed to three potential areas for enhancement. First, the G4W collaboration showed qualities linked to successful governance and highlighted the importance of retaining these features, for instance by succession planning for key leaders and linkers. Second, there are opportunities to develop plans and monitoring strategies for coordinated ecological impacts on public and private land. Research is pointing to new options in cities, for example using pollinators as conservation targets (Hall et al. 2017). Third, community health and

wellbeing contributions merit further consideration and exploration. Attention could be given to how G4W can better complement or support Council's social and wellbeing programs.

Our assessment was based on research findings from an exploratory case study. While a member survey quantitatively showed that a high proportion of members carried out wildlife gardening activities, much of the remaining case study data was qualitative or anecdotal. Ways to validate, better understand, or quantify our findings should be considered. More studies are needed to test the utility of the framework in a range of contexts.

## Implications for urban conservation

Our assessment of an urban wildlife gardening program using a community capacity framework shows that it builds capital for conservation, including wellbeing and social connections, and increases conservation action. A community capacity approach helps to focus attention at the outset on 'the diverse kinds of capacities required at all levels – from governments to community groups to individuals...[and] a culture grounded in a credible commitment to collaboration essential to engender local trust and reciprocity' that are required for community based conservation initiatives to succeed (Curtis et al. 2014: 191). Such a focus is particularly applicable to urban areas where many forms of land (including residential plots) are undervalued as conservation spaces and their land managers poorly engaged as conservation actors (Ernstson et al. 2010). Similarly, formal mechanisms to assess involvement of these actors and the social and ecological impacts are poorly developed. Applying a community capacity framework aids recognition of an initiative's potential social and ecological outputs, stimulates understanding of how these outputs are derived and interactively developed, and facilitates consideration of how to improve conservation and wellbeing outcomes longer-term and in integrated ways.

## Conclusion

Community capacity building is a concept generally used in community health or social development to focus on how a community can harness its resources to address collective challenges and foster its wellbeing. It is relevant to urban biodiversity conservation, where flexibility, creativity, and community involvement are required in an operating environment of complexity and uncertainty. The capacity building framework I developed provides a means to facilitate shared learning about a program, its conservation and social context, and opportunities for progressing action. As demonstrated by the case study, the very process of carrying out a program can develop its own capacity as a vehicle of change: in this case engaging more actors, developing shared values and knowledge, and nurturing a conservation-focused collaboration with mutual trust and respect amongst diverse social actors. Using a framework like this highlights that an ecological program embedded in a social context has social outcomes that may be undervalued or unknown, for example

strengthening participants' connections to place and community, and giving them a sense of wellbeing. It focuses attention on the critical role of community capacity to achieve the long-term goals of biodiversity persistence and community wellbeing, and provides a way to value, monitor, and improve it. I endorse further consideration of this approach in cities, where engaging residents and other potential actors in biodiversity stewardship is often poorly considered, as are associated opportunities for strengthening social cohesion and wellbeing.

## 8 CONCLUSION

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*Evolution is not a destiny, but a blind unfolding that takes place in time to the rhythms around you. The faster you run... the more the world moves too.*

The Red Queen exhibition pamphlet, Museum of Old and New Art, Tasmania 2014

### Introduction

In this research I investigated how an urban community might concomitantly foster its native biodiversity and wellbeing by involving residents in gardening as part of a community biodiversity conservation program. Using a qualitative research strategy (described in Chapter 2), I explored social and ecological dimensions of a purposively chosen wildlife gardening program run by a local government - community group partnership (described in Chapter 3). From my findings, I provided empirical evidence that this program engages and sustains residents in conservation behaviours and discuss the key factors responsible (Chapter 4). I developed a model for how a land stewardship ethic and practice develops and compared this to pro-environmental behaviour change models, noting the need to recognise the interactions that occur between factors over time, including practising the behaviour (Chapter 5). I described feelings of subjective wellbeing and connections with place, nature and community that participating in the program generates, and their relationship to the program's social framework and features (Chapter 6). Lastly, I developed a community capacity building framework and used it to assess the impact of the program. I showed how the program strengthens and deploys its community's social and ecological resources for conservation, and how using such a framework supports an integrated approach to social and ecological issues (Chapter 7). In this chapter, I summarise my findings, draw overarching conclusions, and explain their significance. I discuss implications for theory, policy and practice, and recommend areas for further research.

### Key findings and their significance

This research focuses on the elusive and problematic question of how to harness the potential of cities and their human communities to conserve biodiversity and benefit their wellbeing (Puppim de Oliveira et al. 2011, Schwartz et al. 2014). My findings provide five important insights for urban native biodiversity conservation. First, urban residents can be engaged to foster native biodiversity in their own gardens as part of a community – local government conservation initiative. The findings show workable opportunities to harness the conservation potential of residential and other parcels of urban land by engaging individuals managing that land in municipal conservation efforts. By contrast, urban conservation activities have been directed largely to public land with opportunities for residents to participate focused on volunteering in local parks and reserves (Dearborn and Kark

2010), participating in citizen science (Cooper et al. 2007), or contributing donations or political support (Dunn et al. 2006, Hall et al. 2017). This approach can be used to augment conservation activities on public land and strategically targeted in locations and ways that improve habitat for particular species or ecological communities.

Second, social dimensions prove to be as, if not more, important than ecological factors in affecting how and why urban residents are engaged in conservation and in determining the benefits achieved. In Chapter 4 I described the five key program factors that support the engagement and retention of urban residents in wildlife gardening. One is ecological (a plant nursery propagating and stocking indigenous species), and four are social: an interactive garden assessment that inspires, educates, and provides practical gardening advice; locally sited communication hubs, including the nursery where volunteers offer advice as well as plant materials; a framework that fosters experiential learning and community linkages; and endorsement of each garden's potential conservation contribution. Underpinning the engagement process are the hands-on involvement of program participants in conservation activities and the involvement of local government and community members.

Third, urban residents with a diversity of backgrounds, values, and gardening experience can be introduced and supported to adopt private land stewardship values and practice. I define land stewardship in this context as managing one's land to help indigenous biodiversity to persist, as a personal responsibility, for the benefit of the community and nature. The urban locale, in and of itself, does not preclude stewardship development, contrary to some speculation that rural landholders more readily engage in land stewardship because of "unique environmental place meanings and sense of place that often emerges in rural settings" (Huddart-Kennedy et al. 2009). Conservation meanings and values can develop from urban gardening, a home-based activity through which a significant number of people make connections with nature, from gardeners with no experience to those with a range of gardening experiences and styles. I presented a model for the stewardship development process (Chapter 5), which shows that it is underpinned by learning by doing and occurs through a complex interplay between performing stewardship activities; gaining stewardship knowledge, competence, and confidence; strengthening stewardship beliefs and purpose; and growing attachments to place, nature, and community. Importantly, a wildlife gardening program can help initiate as well as support stewardship development through key program features described in Chapters 4 and 5. Having pro-environmental values or a strong sense of connectedness to nature are not pre-requisites, although interactions with wildlife in the garden or neighbourhood, particularly birds, are a source of motivation and satisfaction.

Fourth, connections to nature and community, and feelings of personal wellbeing (described in Chapter 6) can be generated from participating in a municipal wildlife gardening program. Members described improved connections with local government, primarily through personal relationships developed with program staff, and feeling connected with other program members in working to a shared conservation purpose. Feelings of wellbeing came not only from experiencing nature but learning new things, sharing learning and experiences with others, having a purpose, and making a contribution to the community and nature conservation. Feeling able to make a meaningful contribution and hope for positive outcomes are sentiments viewed as catalysts for pro-environmental action (Quimby and Angelique 2011) as well as facets of subjective wellbeing (Dolan et al. 2011). By contrast, perceived ineffectuality of one's actions is a barrier to living in an environmentally friendly manner (Quimby and Angelique 2011) and can lead to 'learned helplessness' about addressing the uncontrollable outcomes (Abramson et al. 1978). The findings here may be a case for learned hope. They signal a pathway by which urban communities can engage residents in fostering native biodiversity on their properties, while stimulating the achievement of individual wellbeing and social benefits. Key features of the program that drove social and wellbeing benefits include: demonstrated involvement of local government and community, personal interaction, affirmation of the garden's conservation contribution, and access to advice and support.

Lastly, community capacity building can serve as a framework for considering both the social and ecological dimensions of urban conservation programs. Community capacity building is a concept that is more often used in the areas of community health or social development rather than in biological conservation. I developed a community capacity framework (described in Chapter 7) for assessing how a conservation program strengthens a community's ability to address both its biodiversity and wellbeing challenges in the long term. It takes a systems approach, focusing on social actors and their interactions, different forms of resources (capital) available to the community, the deployment of resources by social actors to achieve the long-term goals, and how capacity is strengthened through the deployment process itself. In the case study this included building natural capital; linking and engaging more residents in wildlife gardening; developing land stewardship knowledge and skills; strengthening participants' feelings of wellbeing and connections to community and place; and fostering shared values, trust, and respect between the council and community group partners. With the exception of the first two, these elements were not considered or tracked at the commencement of the program, reflecting the ecological focus that many conservation programs have. The assessment also pointed to potential improvements to the program: the maintenance of successful governance features, planning for specific ecological impacts through coordinated private and public land management, and strengthening complementarity with other Council programs. Using a community capacity framework can highlight previously unknown or poorly considered social benefits that conservation programs can provide to urban communities,

and conversely, how previously overlooked community members, groups, and institutions can be engaged to foster biodiversity with wellbeing benefits.

## Conceptual contributions

The theoretical contributions of this thesis are twofold. First, I developed a conceptual model for how urban private land stewardship practice develops in the context of a supportive program and then compared it to commonly used models of pro-environmental behaviour change (Chapter 5). This model contains an initiation phase where joiners are introduced to the concept of indigenous species; the purpose, activities and materials of stewardship practice; and where to get ongoing support for their practice. A development phase follows in which stewardship develops through a complex interplay between stewardship action, competence, knowledge, and beliefs and values. Learning by doing with rewarding results is the engine of change. Three factors are shown that may promote or hinder the process: affirmation that one's efforts are contributing to conservation, community involvement, and available resources (e.g. advice, prompts, time, dollars, available indigenous plants). This model can be used to consider the relationships between factors that contribute to stewardship development over a period of time. By contrast, I caution that linear pro-environmental behaviour change models which show behaviour as the endpoint of 'precursor' variables and omit feedback loops limit insights into behaviour maturation. Practitioners may give undue weight to interventions on 'upstream' factors in these models and underestimate the importance of performing pro-environmental behaviour on its development, as well as the strengthening of other variables in mutually reinforcing interaction.

Second, I developed a framework using the concept of community capacity building to assess conservation programs (Chapter 7). This framework represents the first attempt to explicitly incorporate wellbeing as a desired outcome of conservation programs, alongside biodiversity objectives. It confronts the dynamism of the urban socio-ecological environment by focusing on how a program (post-hoc or ex-ante) changes a community's capacity to achieve long term biodiversity persistence and community wellbeing, capacity that may be directed in different ways (for example actions) to suit changing circumstances (for example different weather patterns, or newly targeted species). Capacity is defined in terms of human, social, natural (ecological), and economic capital, and their deployment in conservation action. Using the framework helps to: recognise a conservation program's social as well as ecological dimensions, stimulate learning about how its social and ecological outcomes are derived, and facilitate consideration of how the social and ecological benefits for the community can be improved in an integrated way.



## Implications for policy and practice

Native biodiversity conservation in urban areas requires approaches suited to fragmented landscapes dominated by large human populations. Important strategies include protecting and improving parks and reserves, developing buffers around these habitat patches, and linking them with corridors. Findings from this research point to the feasibility and merit of engaging urban residents to manage their land to support these conservation land management strategies. This approach is known as ecological land use complementation (Colding 2007: 50), that 'may not only increase habitat availability for species confined to urban areas, but also ... nurture species movement, facilitating key ecosystem processes such as pollination and seed dispersal'. The key program features described here, and the explanation of the process by which a stewardship ethic and practice develops, provide insights to local government and community groups for how they might develop similar programs and facilitate residential engagement. Of particular importance to note is that residential participation is supported by tangible involvement of community members and local government, face-to-face interaction, and endorsement that their work is making a contribution.

My findings show that a wildlife gardening program, structured as a local government-community group collaboration, concurrently produced benefits for individuals, the community, and biodiversity. These included personal feelings of wellbeing; knowledge and skills development including caring for wildlife and the environment; stronger connections between participants and with nature, place and community; stronger relationships between local government, community organisations, and residents around fostering indigenous biodiversity; removal of environmental weeds, habitat improvement, and protection of remnant habitat on private property; and location and propagation of threatened indigenous species in the municipality. These results point to better integrating environment and health portfolios in cities, looking for opportunities that engage diverse community members in helping to care for the environment while providing personal wellbeing and social benefits.

In Chapter 7 I joined others in cautioning against reliance on time-bound ecological outcomes alone to assess the impact of urban conservation programs in the short term. This is due in part to the dynamism of the urban environment, the multiplicity of factors influencing the outcome in unknown ways, and the unpredictability of long-term results. It is also due to the importance of considering social as well as ecological issues. As shown by my findings, sometimes-unanticipated social benefits, like wellbeing and community connections, derived from participating in the case study program. The program plays an influential role in building its community's capacity, including residential conservation actions, to continue conservation into the future. I share the view that conservation is a learning process and proffer a community capacity building assessment tool to support that learning. To facilitate use of this tool by practitioners, I populated it with factors

indicative of success from the community health and conservation literature (Chapter 7). I also provided suggestions for reviewing conservation program governance, noting factors identified in the literature that are crucial for successful collaborative agency – community initiatives.

This research was exploratory and qualitative. I do not offer the findings here as a prescription for success, but rather as insights to be further tested, and considered and used by practitioners in relation to their own contexts. In Chapter 3, I described features of the case study and its context to assist with assessing its reliability and transferability to other settings. While some of the findings (and certainly the tools) will be relevant to urban areas in developed countries hosting native flora and fauna, they are probably most immediately transferable to cities with gardening patterns and urban governance arrangements similar to Australia, like the United States, Canada and New Zealand.

## Further research

There are several areas in which further research would help illuminate the findings from this study. First, findings on the ability of the program to engage residents, the instrumental program features, and the impact of program participation on wellbeing and connections to nature and community, could be tested with the broader G4W membership and in other populations. Second, findings for the development of land stewardship, including posited relationships in the conceptual model, could be tested in the G4W membership and in other populations. Qualitative methods could be used to test and improve the model's strength as a process theory, for example using theoretical sampling and a grounded theory approach, with particular attention to the proposed interactive relationship between factors over time. Using the model to interpret findings from other conservation behaviour or land stewardship development programs could also help test its utility. Lastly, the value of a community capacity assessment framework like the one developed here can be tested and improved as it is applied to various initiatives in a range of contexts.

Beyond testing and extending this study's findings are research opportunities to explore the application of the findings to urban native biodiversity conservation for social and ecological benefits. For example: How can local government-community collaborations, like G4W, be developed and involved in formulating municipal conservation goals and strategies, monitoring impacts, and adjusting plans accordingly? What are the conservation outcomes of this work? What are appropriate monitoring targets and strategies for urban ecosystems and how are they best developed? What and how can other forms of urban land and land management (e.g. community gardens, brownfield sites, apartment/townhouse complexes) be engaged in municipal conservation programs like wildlife gardening? What and how can other urban resident interactions with nature be supported by municipal collaborations to achieve social and conservation outcomes? How can

municipal wellbeing strategies and initiatives be integrated with conservation strategies for social and ecological benefit?

## Closing remarks

This research has provided new knowledge and valuable insights into how urban communities can engage members in contributing through their gardening to fostering local biodiversity, with concomitant wellbeing and social benefits. The approach is social and personal, involving face-to-face interactions and a collaboration between community and local government, with tangible participation from all those involved in caring for nature. The pathway illuminated by this case study is gaining traction, as evidenced by an initiative recently launched in the Australian state of Victoria to support urban local government-community group partnerships to engage local residents in caring for nature through gardening and other habitat improvement activities in public and private green spaces. In the spirit of continual learning, its work includes studying social and environmental outcomes from the participating partnerships, and how they can be supported to grow and develop. These findings should encourage urban policy makers and conservation practitioners to tackle the challenges of urban biodiversity conservation and wellbeing through integrated strategies and policies, seeking opportunities to recognise and empower residents to see nature in new ways, working with them to foster native biodiversity, and strengthening connections with nature, place and community.

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# APPENDICES

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School of Global, Urban and Social Studies

Dear Sir/Madam,

My name is Laura Mumaw, and I am a PhD candidate at RMIT University in Melbourne. I am researching how we can encourage and support urban residents to care for native plants and animals in their backyards, what the outcomes of participation are, and how these might be strengthened. Gardening for wildlife is the activity I am studying.

The information statement enclosed with this letter outlines the project in greater detail, including what would be required of anyone interested in participating.

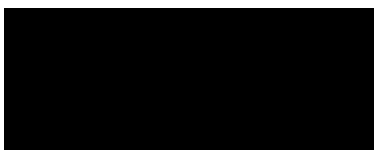
I would welcome your involvement in this study. If you are interested, please contact me directly using my contact details below. The easiest and quickest way to reach me is by email.

Alternatively, you can tick the box at the bottom of this page, and provide your contact details and a time that would suit for me to contact you. Please return this single sheet in the self-addressed envelope provided.

If you have further questions or queries before you decide whether you would be interested in participating, please feel free to contact me at any time.

For those not interested, thank you for considering my project, and best of luck with your wildlife gardening!

Yours Sincerely,



Laura Mumaw BSc, Biology; MSc Fisheries  
RMIT University, School of Global, Urban and Social Studies  
GPO Box 2476  
Melbourne VIC 3001  
Office: 03 9925 5099  
Email: laura.mumaw@rmit.edu.au

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**Yes, I would like to express my interest in participating in this research project**

Name:

Tick box

Contact details (phone, email):

Best time to contact me (time of day, day of week):

## Research Information Sheet

You are invited to participate in a research project being conducted by RMIT University. Please read this sheet carefully and be confident that you understand its contents before deciding whether to participate. If you have any questions about the project, please ask one of the investigators.

### ***Who is involved in this research project?***

My name is Laura Mumaw, and this research is being conducted as part of my PhD degree. My Senior Supervisor is Associate Professor Sarah Bekessy, School of Global, Urban and Social Studies. The research project is titled – *Yes! In my Backyard: Caring for Native Biodiversity in the City*.

### ***Why is it being conducted?***

The aim of this research is to better understand how we can foster the participation of city dwellers in caring for native plants and animals, what the social and ecological outcomes are, and how these might be strengthened. Gardening for wildlife is being used as the activity under study. The intent is for this research to be useful to the Knox Gardens4Wildlife program and other local government and community groups involved in native biodiversity research and conservation.

### ***Why have you been approached?***

This phase of the research involves interviewing twenty Knox Gardens4Wildlife members. We are hoping to interview members representing a broad diversity of reasons for joining, length of involvement in the program, and wildlife gardening activities. You have been approached to participate because of your membership in Knox Gardens4Wildlife.

### ***What are the questions being addressed?***

We are studying what factors contribute to participants beginning and continuing to garden with native plants, and in a wildlife gardening program. We are also interested in what garden activities participants undertake, and what the outcomes of participation are. Information from the interviews will be analysed and will form the basis for further research, for example, a survey of a large group of wildlife gardeners.

### ***If I agree to participate, what will I be required to do?***

If you agree to participate I will interview you at a time convenient for you. The interview is estimated to take one hour. The interview will take place at an agreed location, preferably in your garden. A benefit of doing it in your garden is your ability to point out examples of what you are telling me. If this is not suitable, a mutually agreed place (eg local library or Knox Council meeting room) will be arranged.

In the interview I will ask you a few questions about the history of your gardening with native plants, your involvement in Gardens4Wildlife, wildlife you notice in your garden, the results of participating, and how you feel about wildlife gardening and nature conservation in the City of Knox. With permission from you, the interview will be recorded to assist in data collection and analysis.

If possible and with permission from you, I would like to take pictures of features of your garden that illustrate your comments. I will not take pictures of anything you do not wish me to. I will avoid including any features that might identify your property and no people will be included in any photos. I will seek your written approval to use any specific pictures in publications or presentations.

Prior to the interview I will also send you a brief one page questionnaire asking some basic information about yourself – (eg how long you have lived in Knox, your work status, age category, postcode). There is no obligation to answer any questions you do not wish to.

***What are the possible risks or disadvantages of participation? What are the benefits?***

There are no perceived risks to participation. There is no direct benefit provided to you for your participation.

***What will happen to the information I provide?***

Any information you provide will be treated as strictly confidential and not used for any purpose outside of the research project. All data collected will remain anonymous; codes or pseudonyms will be used in the preparation of findings and the publication or presentation of results. The interview recording, transcript and pictures will be kept for a maximum of 5 years and stored securely on University premises. No one other than myself will have access to this information.

The research findings will be provided to the Gardens4Wildlife coordinator for program improvement. Findings may be presented at talks, conferences and published in academic journals. A PHD thesis will be maintained in the RMIT Repository which is a publicly accessible online library of research papers. You will also be sent a summary of the research findings.

If you desire, you will be sent a transcript of your interview, which will allow you to review what was discussed. Any concerns about the content of the transcript can then be discussed with me.

***What are my rights as a participant?***

- The right to withdraw from participation at any time;
- The right to request that any recording cease;
- The right to have any unprocessed data withdrawn and destroyed, provided it can be reliably identified, and provided that so doing does not increase the risk for the participant.
- The right to be de-identified in any photographs intended for public publication, before the point of publication;
- The right to have any questions answered at any time.

Prior to commencing the discussions and interviews, I will ask you to sign a consent form (attached).

***What if I have further questions?***

If you have any questions or concerns, or wish to discuss any aspect of this research in greater detail, please feel free to contact me or RMIT University at any time.

Yours sincerely,

Laura Mumaw BSc, Biology; MSc Fisheries  
RMIT University  
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Melbourne VIC 3001  
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Dr Sarah Bekessy, Associate Professor  
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Melbourne VIC 3001  
Office: 03 9925 1858  
Email: [sarah.bekessy@rmit.edu.au](mailto:sarah.bekessy@rmit.edu.au)

If you have any concerns about your participation in this project which you do not wish to discuss with the researchers, you may contact the Ethics Officer, Research Integrity, Governance and Systems, RMIT University, GPO Box 2476V, Melbourne, 3001. Tel: (03) 9925 2251 or email: [human.ethics@rmit.edu.au](mailto:human.ethics@rmit.edu.au).





## CONSENT TO PARTICIPATE IN A RESEARCH PROJECT

**Project Title:** *Yes! In my Backyard: Caring for Native Biodiversity in the City*

**Investigators:**

- Laura Mumaw, Bsc Biology, MSc Fisheries, RMIT University PhD Student, [laura.mumaw@rmit.edu.au](mailto:laura.mumaw@rmit.edu.au), 03 9925 5099
- Dr Sarah Bekessy, Associate Professor, School of Global, Urban and Social Studies, RMIT University, [sarah.bekessy@rmit.edu.au](mailto:sarah.bekessy@rmit.edu.au), 03 9925 1858

If you have any concerns about your participation in this project which you do not wish to discuss with the researchers, you may contact the Ethics Officer, Research Integrity, Governance and Systems, RMIT University, GPO Box 2476V, Melbourne, 3001. Tel: (03) 9925 2251 or email: [human.ethics@rmit.edu.au](mailto:human.ethics@rmit.edu.au).

### CONSENT

1. I have had the project explained to me, and I have read the information sheet.
2. I agree to participate in the research project as described.
3. I agree:
  - to be interviewed and/or complete a questionnaire
  - that my voice will be audio recorded
  - that photographs may be taken of my garden with my permission
4. I acknowledge that:
  - (a) I understand that my participation is voluntary and that I am free to withdraw from the project at any time and to withdraw any unprocessed data previously supplied (unless follow-up is needed for safety).
  - (b) The project is for the purpose of research. It may not be of direct benefit to me.
  - (c) The privacy of the personal information I provide will be safeguarded and only disclosed where I have consented to the disclosure or as required by law.
  - (d) The security of the research data will be protected during and after completion of the study. The data collected during the study may be published, and a report of the findings will be provided to Gardens4Wildlife. Any information which will identify me will not be used.

### Participant's Consent

Participant: \_\_\_\_\_  
(Signature)

Date: \_\_\_\_\_

Name (please print) :

## Appendix 2 – Letter of approval from Ethics Committee



Design and Social Context College Human Ethics Advisory Network (CHEAN)  
Sub-committee of the RMIT Human Research Ethics Committee (HREC)

### Notice of Approval

**Date:** 3 March 2014

**Project number:** CHEAN A 0000017158-01/14

**Project title:** Yes! In my Backyard: Caring for Native Biodiversity in the City

**Risk classification:** Low Risk

**Investigator:** Dr Sarah Bekessy

**Approved:** From: 3 March 2014 To: 1 January 2016

I am pleased to advise that your application has been granted ethics approval by the Design and Social Context College Human Ethics Advisory Network as a sub-committee of the RMIT Human Research Ethics Committee (HREC).

Terms of approval:

**1. Responsibilities of investigator**

It is the responsibility of the above investigator/s to ensure that all other investigators and staff on a project are aware of the terms of approval and to ensure that the project is conducted as approved by the CHEAN. Approval is only valid whilst the investigator/s holds a position at RMIT University.

**2. Amendments**

Approval must be sought from the CHEAN to amend any aspect of a project including approved documents. To apply for an amendment please use the 'Request for Amendment Form' that is available on the RMIT website. Amendments must not be implemented without first gaining approval from CHEAN.

**3. Adverse events**

You should notify HREC immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.

**4. Participant Information and Consent Form (PICF)**

The PICF and any other material used to recruit and inform participants of the project must include the RMIT university logo. The PICF must contain a complaints clause including the project number.

**5. Annual reports**

Continued approval of this project is dependent on the submission of an annual report. This form can be located online on the human research ethics web page on the RMIT website.

**6. Final report**

A final report must be provided at the conclusion of the project. CHEAN must be notified if the project is discontinued before the expected date of completion.

**7. Monitoring**

Projects may be subject to an audit or any other form of monitoring by HREC at any time.

**8. Retention and storage of data**

The investigator is responsible for the storage and retention of original data pertaining to a project for a minimum period of five years.

In any future correspondence please quote the project number and project title.

On behalf of the DSC College Human Ethics Advisory Network I wish you well in your research.

**Suzana Kovacevic**

**Research and Ethics Officer**

College of Design and Social Context

RMIT University

Ph: 03 9925 2974

Email: [suzana.kovacevic@rmit.edu.au](mailto:suzana.kovacevic@rmit.edu.au)

Website: [www.rmit.edu.au/dsc](http://www.rmit.edu.au/dsc)

*Appendix 3 – Interview prompts for background information on G4W*

<b>History, goals, process, activities</b>
When did program start – How and why What was its purpose and goals What are the strategies to meet the goals How is success measured How is progress monitored How are gardens assessed and how frequently How do you feel things are progressing What is the process for becoming a member What activities can members join in? What is their relative popularity?
<b>Governance and communications</b>
How is program run How is program supported by Council How is program supported by Knox Environment Society How is program advertised
<b>Members and participation</b>
Number of members, year of joining, postcode How do you map location of members' gardens?



**Profile questions –**

1. Surname/Family Name: .....
2. Gender (please circle):                      a. Female                      b. Male
3. How old are you? (please circle):
  - a. <25 years
  - b. 25 to 34 years
  - c. 35 to 44 years
  - d. 45 to 54 years
  - e. 55 to 64 years
  - f. 65 to 74 years
  - g. 75 plus years of age
  - h. I prefer not to answer this question
4. What is your cultural background? (e.g. the cultural heritage of yourself and/or your parents)  
.....
5. If born overseas, how many years have you lived in Australia?.....
6. What is the highest level of education you have completed? .....
7. What sort of work do you usually do (or if retired did you usually do)?  
.....
8. What is your current work status? (Please circle)
  - a. full-time (35 hours or more)
  - b. part-time (<35 hours/week)
  - c. not employed, looking for work
  - d. not employed, not looking for work
  - e. retired
  - f. full time student
9. What is the postcode of the suburb your Gardens4Wildlife garden is in? .....
10. How long have you lived at this property?.....
11. Do you (please tick one that applies):  
 rent                       own/have a mortgage on this property?
12. In this household are children aged (please tick all that apply):  
 pre-school /younger     primary school     secondary school
13. How long have you lived in the City of Knox? .....

**Note: If you do not wish to answer any question, please draw a line through it.**

**Thank you**

*Appendix 5 - Knox City 2009 G4W member survey questions*

1. Was the garden assessment useful?  
Comments:
2. Was the pre-assessment pack useful?  
Comments:
3. Was the report useful?
4. How many indigenous plants have you planted in your garden since starting the G4W program?  
o  
1-25  
25-50  
50-75  
75-100  
More than 100
5. How many environmental weeds have you removed since joining the G4W program?  
o  
1-25  
25-50  
50-75  
75-100  
More than 100
6. What has been the most useful part of the program?
7. What has been the least useful?
8. Have you placed your Gardens for Wildlife sticker on your letterbox?
9. Do you need a new Gardens for Wildlife sticker for your letterbox? If yes, please specify your letterbox construction.
10. Would you like someone to contact you for a garden re-assessment?  
Comments:
11. Are you interested in volunteering for the program?  
Comments:
12. Are you a member of any environmental groups? If so, what?
13. Can you suggest any future improvements for the program?
14. Further comments:

*Appendix 6 – Aspects of G4W member diversity elucidated in garden assessor group interview*

**Motivation**

- To create educational space for the family
- To help keep native wildlife in Knox
- To recreate bushland in a garden
- To learn about gardening basics
- To attract wildlife to the garden
- To create nature play space for children
- To be part of the Knox community
- To be socially involved in a community group
- To get advice or purchase indig plants, and for specific reasons - eg drought resistant, screening, shade loving

**Knowledge and Experience**

- Inexperienced gardener
- Experienced wildlife/native plant gardener
- New property – needs work or work different to their gardening experience

**Time of Life**

- Young family
- Retiree, free time
- Recently recovered or stricken w/illness

**Method of introduction**

- Welcome pack
- Personal connection/intro
- Advice from arborist, council staff helping with problem

**Involvement in Gardening 4 Wildlife**

- Pre-assessment
- Post assessment
- Length of time in program
- Active participation in social events
- Want reassessment
- Haven't heard from them

**Gardening activity after joining**

- Wildlife habitat (frog bog, thickets)
- Weed removal
- Insert indig plants into European garden
- Haven't done anything

**Type of Garden**

- Small suburban
- Adjoining / having remnant bush
- Manicured, European

**Location of Garden, eg**

- The Basin
- Rowville, etc

**Length of Residency**

- New to neighbourhood
- Old time residents
- Someone who purchases previous G4W property

## *Appendix 7 - Prompts for semi-structured interviews of G4W members*

### **Commencement and engagement in wildlife gardening / personal & neighbourhood context**

1. Can you briefly describe the history of your gardening this property? What was here when you started? How and why did you change things?
2. How long have you been wildlife gardening? (determine how they define 'wildlife gardening'). How did you first get interested? Can you tell me why and where you started? What did you do? What were the results?
3. Have gardens and greenery in this area changed in the time you've been here? What do you think about that? Does it affect your gardening plans?

### **Commencement and involvement in Gardens4Wildlife – use of features**

4. When did you join Gardens 4 Wildlife? Why? Have you got what you wanted from the program?
5. What features of the program have/do you use? (Note: probe for KES, volunteers/ community involvement, plant vouchers, open house, newsletter, website, garden assessment)? What do you find most useful? Most valuable? Why? What would you like more of or different?
6. How did you find the garden assessment? Have you been able to follow the recommendations? Why or why not?
7. Has being in the program changed your gardening or other activities? If so, how? (Probe for confidence, approach, how often, plant purchases or why, sustainable practices)? Do you talk to others about it, if so who?
8. Are there things you wouldn't have done if you hadn't been involved in the program?
9. Have you had any difficulties, challenges, frustrations? What kept you going?

### **Outcomes from wildlife gardening**

10. What are your future gardening plans? Do you think you'll continue to wildlife garden? What keeps you motivated? Do you think you'll continue in the program? Why/ why not?
11. How have your approach/ plans/ confidence/ skills changed over time?
12. What benefits do you feel you get from wildlife gardening? From being in the program?
13. How do you think participation has affected your health and wellbeing?

### **Views on wildlife and native wildlife conservation**

14. What do you think about native wildlife in a city like Knox? Indigenous plants and animals?
15. Have you noticed any changes in the wildlife in your garden? Why do you think this is so? When do you observe them? In your neighbourhood? How do you feel about it? Does it affect how you garden?
16. What does native plant/animal conservation mean to you? Do you think there's a place for it in Knox? Who should be involved and how? Do you think wildlife gardening can help? Do you participate in nature conservation activities?

### **Sense of connection**

17. Can you tell me a bit about any feelings of connection or attachment you might have with
  - a. your garden
  - b. nature
  - c. the neighbourhood/community
  - d. Knox City
  - e. Gardens4Wildlife members - do you know/ interact with other G4W members?How do you think your feelings have been influenced by your gardening or membership in the program?

### **Citizen Science**

18. If the program asked you to help record information about native plants or wildlife in your garden, or become involved in a research program to better understand and support native plant and animal conservation in Knox, would you be willing to participate? Do you think it's a good idea?

*Appendix 8 – Garden assessor group interview discussion sheet*

**1. Members – How can we select a group that represents a cross section of their diversity?**

How would you define the different types of members you've had involvement of? Can you think of some examples?

**2. My wildlife gardening experience**

Reasons I started wildlife gardening

Why I continue to wildlife garden

Why I became an assessor

Rewards and challenges I get from being involved in the program