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Strengthening Wellbeing in Urban Communities Through Wildlife Gardening

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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 we explore the understudied relationship between actively conserving nature in urban backyards and gaining wellbeing benefits. We investigate 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 participants' wellbeing. Participants 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 care for nature 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.

Keywords

wildlife gardening, nature, conservation, wellbeing, urban community

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INTRODUCTION

Improving the wellbeing of citizens is a stated priority of many governments (Bache and Reardon 2013, Austin 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). We define subjective wellbeing 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 benefits provided to communities by natural environments (e.g. food, shade, air purification, clean water, stormwater mitigation) are often valued and quantified economically (McDonald 2015). However the range of physical, psychological and cultural wellbeing benefits arising 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 their growth and environmental impact (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 we mean any activities directed to fostering the persistence of native species into the future. We 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. We 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.* 2010, Threlfall *et al.* 2016).

Residents are important potential land conservation actors since: residential gardens comprise a sizable proportion of urban land (estimated to be approximately 25% of total urban land area, including that covered by buildings, 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.* 2010). 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 or occupiers 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, Keniger *et al.* 2013, Russell *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 (see 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 greenspaces and as home gardens. Accessibility, control, and privacy were key distinguishing features of home gardens (Bernardini and Irvine 2007). Public greenspaces 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 (≥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.* 2006, 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 (Doody *et al.* 2009, Goddard *et al.* 2010). 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).

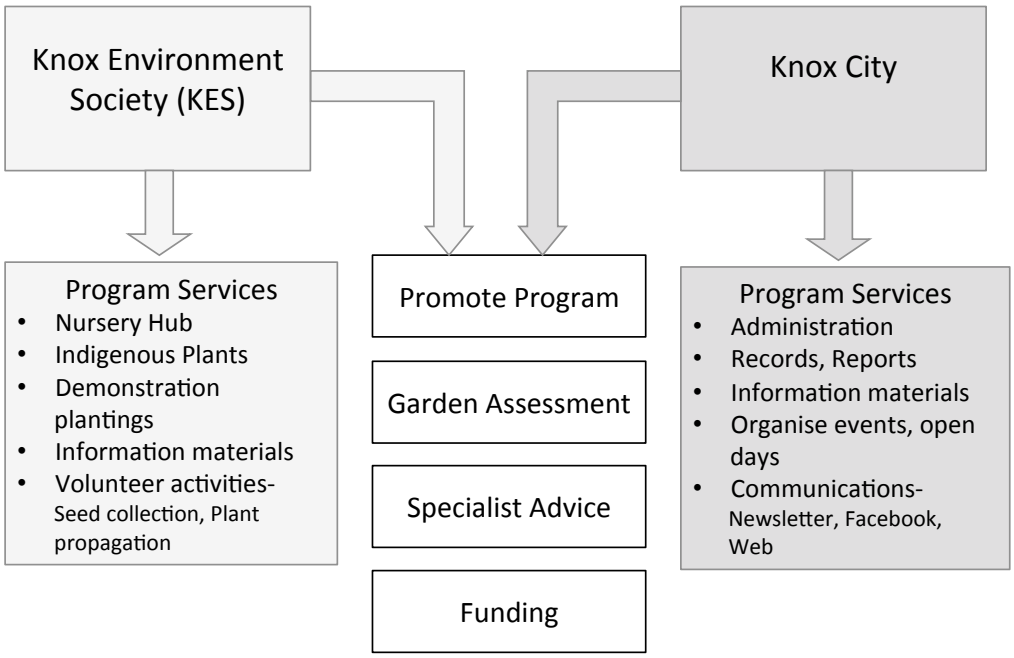
We report here on a study within a larger qualitative, revelatory case study (Yin 2009) of a novel form of municipal wildlife gardening structured as a local government/community group conservation partnership. The case study uses interview data from a variety of actors and inductive analysis to explore how such a program can build urban community capacity to care for its native biodiversity and foster wellbeing. Results of other aspects of the study are reported elsewhere (Mumaw and Bekessy 2017). 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 as an informal collaboration between a local government (Knox City) and community group Knox Environment Society (KES) in greater Melbourne Australia. Program services are provided by each organisation (Figure 1). G4W's goal was to encourage residents to value local biodiversity and to help 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).

Figure 1. Gardens for Wildlife Program Services



Over time, G4W Knox City managers and KES office holders began to notice and appreciate social benefits from the program; these are now being considered as performance indicators. No specific conservation performance measures have been set although numbers of members is tracked, periodic surveys of members' weed removal and indigenous species plantings have been conducted (Mumaw and Bekessy 2017), and location of members' gardens is mapped on Knox City's spatial information system.

According to organisers, membership has continued to grow at between 50 to 70 new members a year net since 2009. Over 600 households participated in the program at the time interviews were carried out in 2014. Gardens range in size from apartment blocks to semi-rural properties. 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 support hubs.

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 was 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 the RMIT University 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 1). Six assessors provided written responses.

Table 1. Garden assessor open-ended questionnaire

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

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 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). We incorporated prompts about wellbeing and feelings of connection with one's garden, nature, and community into the semi-structured interviews conducted with G4W members (Table 2, 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.

Table 2. G4W member semi-structured interview prompts

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? *(how do 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? 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/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?

Sense of connection

17. Can you tell me a bit about any feelings of connection or attachment you might have with:
    Your garden, Nature, neighbourhood/community, Council. Do you know/ interact with 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 record information about your garden, or get involved in research to understand /support conservation in Knox, would you be willing to participate? Do you think it's a good idea?

Data analysis

Responses from garden assessors were transferred to QSR International's NVivo 10 software (NVivo) and coded 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.

G4W members' interview transcripts were coded line by line using QSR International's NVivo 10 software (NVivo). 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 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

Demographic characteristics of interviewed Gardens for Wildlife members

Interviewed G4W members were diverse demographically, in property features, and in G4W membership characteristics. Seven interviewees were female and nine were male; they ranged in age from under 25 to over 75 years. Twelve interviewees were born and raised in Australia, three in Europe, and one in Southeast Asia. Eight interviewees were employed full-time, three part-time, and five were retired. Interviewees had been G4W members for less than six months to up to eight years, had various sized lots, and had lived at their current addresses, which spanned seven postcodes, from one year to up to 40 years.

Wellbeing benefits

Members and garden assessors described subjective wellbeing benefits from their involvement in G4W 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: "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 during the assessment 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 good about 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 the

experienced and eudemonic forms of wellbeing. Eudemonic wellbeing includes 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 greenspaces 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 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 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 the local council 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, such as these two:

> I just get a buzz out of going down to the indig [indigenous] 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 energized by these people – their attitude and what they want to do, it's so energizing 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 Angelique (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 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 this 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 individual subjective 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 is rarely used as a performance measure 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 (Figure 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) (Figure 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 2. Conservation goals and their benefits

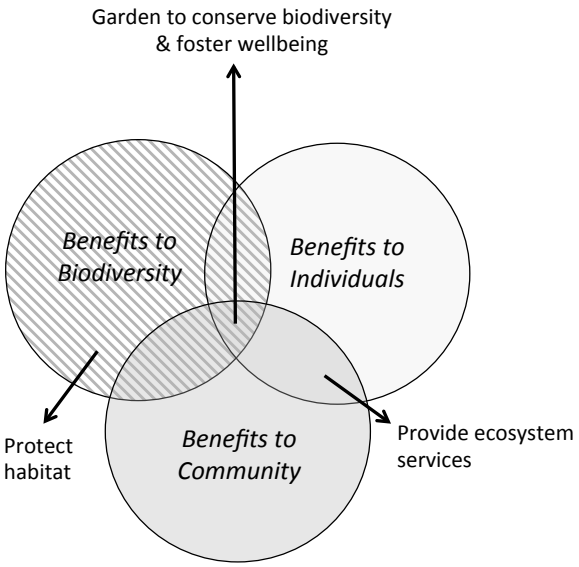


Fig 2a. Goals mapped on Benefits Venn Diagram

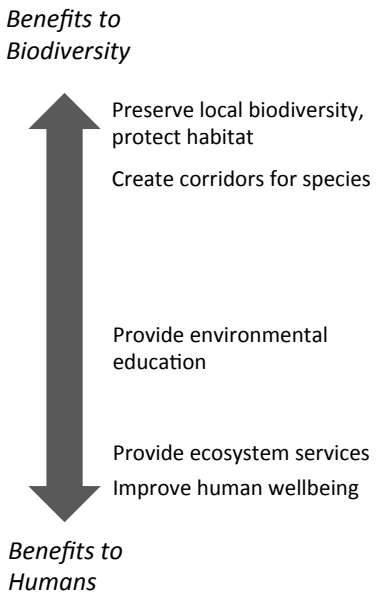


Fig 2b. Goals mapped on Benefits Spectrum
Adapted from Dearborn & Kark, 2010:3

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 former Dean of the Yale School of Forestry and Environmental Studies, Gus Speth:

> 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 participating in urban wildlife gardening add to a body of evidence that experiences in and with nature can contribute to various forms of wellbeing, and that participating in conservation in one's own urban backyard provides additional eudemonic benefits found in organised environmental volunteering on public land. 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 with local government 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 independently contributing to quality of life. Our 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.

LITERATURE CITED

Adams, W.M. and Mulligan, M., 2003. Conclusions. *In*: W.M. Adams and M. Mulligan, eds. *Decolonizing Nature: Strategies for Conservation in a Post-colonial Era*. Earthscan Publications Ltd, 290–299.

Andersson, E., Barthel, S., Borgström, S., Colding, J., Elmqvist, T., Folke, C., and Gren, A., 2014. Reconnecting cities to the biosphere: Stewardship of green infrastructure and urban ecosystem services. *Ambio*, 43 (4), 445–453.

Austin, A., 2016. On well-being and public policy: are we capable of questioning the hegemony of happiness? *Social Indicators Research*, 127, 123–138.

Bache, I. and Reardon, L., 2013. An idea whose time has come? Explaining the rise of well-being in British politics. *Political Studies*, 61 (4), 898–914.

van den Berg, A.E., van Winsum-Westra, M., de Vries, S., and van Dillen, S.M.E., 2010. Allotment gardening and health: a comparative survey among allotment gardeners and their neighbors without an allotment. *Environmental Health*, 9 (1), 74.

Bernardini, C. and Irvine, K.N., 2007. The 'nature' of urban sustainability: private or public greenspaces? *In*: A.G. Kungolos, C.A. Brebbia, and E. Beriatos, eds. *Sustainable Development and Planning III, WIT Transactions on Ecology and the Environment,* 102, Southampton, UK: WIT Press, 661–674.

Bryman, A., 2016. *Social Research Methods*. 5th ed. Oxford: Oxford University Press.

Burls, A., 2007. People and green space: promoting public health and mental well-being through ecotherapy. *Journal of Public Mental Health*, 6 (3), 24–39.

Carr, A., 2002. *Grass Roots and Green Tape: Principles and Practices of Environmental Stewardship*. Sydney: The Federation Press.

Chapin III, F.S., Carpenter, S.R., Kofinas, G.P., Folke, C., Abel, N., Clark, W.C., Olsson, P., Smith, D.M.S., Walker, B., Young, O.R., Berkes, F., Biggs, R., Grove, J.M., Naylor, R.L., Pinkerton, E., Steffen, W., and Swanson, F.J., 2010. Ecosystem stewardship: sustainability strategies for a rapidly changing planet. *Trends in Ecology and Evolution*, 25 (4), 241–249.

Charmaz, K., 2014. *Constructing Grounded Theory*. 2nd ed. London: Sage Publications Ltd.

Clayton, S., 2007. Domesticated nature: Motivations for gardening and perceptions of environmental impact. *Journal of Environmental Psychology*, 27 (3), 215–224.

Darnton, A., 2008. Reference Report: An overview of behaviour change models and their uses [online]. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/498065/Behaviour_change_reference_report_tcm6-9697.pdf [Accessed 28 Jun 2016].

Dearborn, D.C. and Kark, S., 2010. Motivations for conserving urban biodiversity. *Conservation Biology*, 24 (2), 432–440.

Diamant, R., Eugster, J.G., and Mitchell, N.J., 2003. Reinventing conservation: A practitioner's view. *In*: B.A. Minteer and R.E. Manning, eds. *Reconstructing Conservation: Finding Common Ground*. Island Press, 313–326.

Dolan, P., Layard, R., and Metcalfe, R., 2011. Measuring subjective wellbeing for public policy: Recommendations on measures [online]. Available from: cep.lse.ac.uk/pubs/download/special/cepsp23.pdf [Accessed 23 Jul 2015].

Doody, B.J., Sullivan, J.J., Meurk, C.D., Stewart, G.H., and Perkins, H.C., 2009. Urban realities: the contribution of residential gardens to the conservation of urban forest remnants. *Biodiversity and Conservation*, 19 (5), 1385–1400.

Ernstson, H., Barthel, S., Andersson, E., and Borgström, S.T., 2010. Scale-crossing brokers and network governance of urban ecosystem services: the case of Stockholm. *Ecology and Society*, 15 (4), art28.

Goddard, M.A., Dougill, A.J., and Benton, T.G., 2010. Scaling up from gardens: biodiversity conservation in urban environments. *Trends in Ecology & Evolution*, 25 (2), 90–98.

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

Guest, G., Bunce, A., and Johnson, L., 2006. How many interviews are enough?: An experiment with data saturation and variability. *Field Methods*, 18 (1), 59–82.

Hobbs, R.J., 2013. Grieving for the past and hoping for the future: Balancing polarizing perspectives in conservation and restoration. *Restoration Ecology*, 21 (2), 145–148.

Hunter, M.L., 2005. A mesofilter conservation strategy to complement fine and coarse filters. *Conservation Biology*, 19 (4), 1025–1029.

Husk, K., Lovell, R., Cooper, C., and Garside, R., 2016. Participation in environmental enhancement and conservation activities for health and well-being in adults: a review of quantitative and qualitative evidence. *Cochrane Database of Systematic Reviews*, 5, artCD010351.

Kapos, V., Balmford, A., Aveling, R., Bubb, P., Carey, P., Entwistle, A., Hopkins, J., Mulliken, T., Safford, R., Stattersfield, A., Walpole, M., and Manica, A., 2009. Outcomes, not implementation, predict conservation success. *Oryx*, 43 (3), 336–342.

Kapteyn, A., Lee, J., Tassot, C., Vonkova, H., and Zamarro, G., 2015. Dimensions of subjective well-being. *Social Indicators Research*, 123 (3), 625–660.

Keniger, L.E., Gaston, K.J., Irvine, K.N., and Fuller, R.A., 2013. What are the benefits of interacting with nature? *International Journal of Environmental Research and Public Health*, 10 (3), 913–935.

Knox City Council and Knox Environment Society, 2008. *Gardens for Wildlife*.

Kowarik, I., 2011. Novel urban ecosystems, biodiversity, and conservation. *Environmental Pollution*, 159, 1974–1983.

Lewicka, M., 2011. Place attachment: How far have we come in the last 40 years? *Journal of Environmental Psychology*, 31 (3), 207–230.

Loram, A., Tratalos, J., Warren, P.H., and Gaston, K.J., 2007. Urban domestic gardens (X): the extent & structure of the resource in five major cities. *Landscape Ecology*, 22 (4), 601–615.

Maller, C., Townsend, M., Pryor, A., Brown, P., and St Leger, L., 2006. Healthy nature healthy people: 'contact with nature' as an upstream health promotion intervention for populations. *Health Promotion International*, 21 (1), 45–54.

McDonald, R.I., 2015. *Conservation for Cities: How to Plan and Build Natural Infrastructure*. Washington DC: Island Press.

Mcshane, T., Hirsch, P.D., Trung, T.C., Songorwa, A.N., Kinzig, A., Monteferr, B., Mutekanga, D., Thang, H. Van, Dammert, J.L., Pulgar-Vidal, M., Welch-Devine, M., Brosius, J.P., Coppolillo, P., and O'Connor, S., 2011. Hard choices: making trade-offs between biodiversity conservation and human well-being. *Biological Conservation*, 144, 966–972.

Mensah, C.A., Andres, L., Perera, U., and Roji, A., 2016. Enhancing quality of life through the lens of green spaces: A systematic review approach. *International Journal of Wellbeing*, 6 (1), 142–163.

Milner-Gulland, E.J., Mcgregor, J.A., Agarwala, M., Atkinson, G., Bevan, P., Clements, T., Daw, T., Homewood, K., Kumpel, N., Lewis, J., Mourato, S., Palmer Fry, B., Redshaw, M., Rowcliffe, J.M., Suon, S., Wallace, G., Washington, H., and Wilkie, D., 2014. Accounting for the impact of conservation on human well-being. *Conservation Biology*, 28 (5), 1160–1166.

Mitchell, B. and Brown, J., 2003. Stewardship and protected areas in a global context: Coping with change and fostering civil society. *In*: B.A. Minteer and R.E. Manning, eds. *Reconstructing Conservation: Finding Common Ground*. Island Press, 297–311.

Molsher, R. and Townsend, M., 2016. Improving wellbeing and environmental stewardship through volunteering in nature. *EcoHealth*, 13 (1), 151–155.

Moore, M., Townsend, M., and Oldroyd, J., 2006. Linking human and ecosystem health: The benefits of community involvement in conservation groups. *EcoHealth*, 3 (4), 255–261.

Mumaw, L. and Bekessy, S., 2017. Wildlife gardening for collaborative public-private biodiversity conservation. *Australasian Journal of Environmental Management*. DOI 10.1080/14486563.2017.1309695.

NVivo. QSR International Pty Ltd. Version 10.1, 2014.

Pickett, S.T.A., Cadenasso, M.L., Grove, J.M., Boone, C.G., Groffman, P.M., Irwin, E., Kaushal, S.S., Marshall, V., McGrath, B.P., Nilon, C.H., Pouyat, R. V, Szlavecz, K., Troy, A., and Warren, P., 2011. Urban ecological systems: scientific foundations and a decade of progress. *Journal of Environmental Management*, 92 (3), 331–362.

La Placa, V., McNaught, A., and Knight, A., 2013. Discourse on wellbeing in research and practice. *International Journal of Wellbeing*, 3 (1), 116–125.

Puppim de Oliveira, J.A., Balaban, O., Doll, C.N.H., Moreno-Penaranda, R., Gasparatos, A., Iossifova, D., and Suwa, A., 2011. Cities and biodiversity: perspectives and governance challenges for implementing the convention on biological diversity (CBD) at the city level. *Biological Conservation*, 144 (5), 1302–1313.

Quimby, C.C. and Angelique, H., 2011. Identifying barriers and catalysts to fostering pro-environmental behavior: Opportunities and challenges for community psychology. *American Journal of Community Psychology*, 47, 388–396.

Robins, L. and Kanowski, P., 2011. 'Crying for our Country': eight ways in which 'Caring for our Country' has undermined Australia's regional model for natural resource management. *Australasian Journal of Environmental Management*, 18 (2), 88–108.

Rogan, R., O'Connor, M., and Horwitz, P., 2005. Nowhere to hide: Awareness and perceptions of environmental change, and their influence on relationships with place. *Journal of Environmental Psychology*, 25 (2), 147–158.

Russell, R., Guerry, A.D., Balvanera, P., Gould, R.K., Basurto, X., Chan, K.M.A., Klain, S., Levine, J., and Tam, J., 2013. Humans and nature: How knowing and experiencing nature affect well-being. *Annual Review of Environment and Resources*, 38 (1), 473–502.

Ryan, R.L. and Grese, R.E., 2005. Urban volunteers and the environment: Forest and prairie restoration. *In*: P.F. Barlett, ed. *Urban Place: Reconnecting with the Natural World*. The MIT Press, 173–188.

Schwartz, M.W., 2006. How conservation scientists can help develop social capital for biodiversity. *Conservation Biology*, 20 (5), 1550–1552.

Secretariat of the Convention on Biological Diversity, 2012. *Cities and Biodiversity Outlook*. Montreal.

Shwartz, A., Turbé, A., Julliard, R., Simon, L., and Prévot, A.-C., 2014. Outstanding challenges for urban conservation research and action. *Global Environmental Change*, 28, 39–49.

Soga, M. and Gaston, K.J., 2016. Extinction of experience: the loss of human-nature interactions. *Frontiers in Ecology and the Environment*, 14 (2), 94–101.

Stem, C., Margoluis, R., Salafsky, N., and Brown, M., 2005. Monitoring and evaluation in conservation: a review of trends and approaches. *Conservation Biology*, 19 (2), 295–309.

Stiglitz, J.E., Sen, A., and Fitoussi, J.-P., 2010. *Report by the Commission on the Measurement of Economic Performance and Social Progress*. Commission on the Measurement of Economic Performance and Social Progress. Paris.

Tay, L. and Diener, E., 2011. Needs and subjective well-being around the world. *Journal of Personality and Social Psychology*, 101 (2), 354–365.

Taylor, T.E., 2015. The markers of wellbeing: A basis for a theory-neutral approach. *International Journal of Wellbeing*, 5 (2), 75–90.

Threlfall, C.G., Williams, N.S.G., Hahs, A.K., and Livesley, S.J., 2016. Approaches to urban vegetation management and the impacts on urban bird and bat assemblages. *Landscape and Urban Planning*, 153, 28–39.

Waliczek, T.M., Zajicek, J.M., and Lineberger, R.D., 2005. The influence of gardening activities on consumer perceptions of life satisfaction. *HortScience*, 40 (5), 1360–1365.

Wells, N.M. and Donofrio, G.A., 2011. Urban planning, the natural environment, and public health. *In*: J.O. Nriagu, ed. *Encyclopedia of Environmental Health*. Burlington: Elsevier, 565–575.

Woodhouse, E., Homewood, K.M., Beauchamp, E., Clements, T., McCabe, T.J., Wilkie, D., and Milner-Gulland, E.J., 2015. Guiding principles for evaluating the impacts of conservation interventions on human wellbeing. *Philosophical Transactions Royal Society B*, 370, 20150103.

World Health Organisation, 1946. Constitution of WHO: principles [online]. Available from: http://www.who.int/about/mission/en/ [Accessed 1 May 2006].

Yin, R.K., 2009. *Case Study Research: Design and Methods*. 4th ed. Sage Publications, Inc.