



Hobbs, S.J. and White, P.C.L. (2016) 'Achieving positive social outcomes through participatory urban wildlife conservation projects', *Wildlife Research*, 42 (7), pp. 607-617.

Link to official URL: <https://doi.org/10.1071/WR14184>

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Achieving positive social outcomes through participatory urban wildlife conservation projects

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Abstract

Context. As urbanisation continues to increase on a global scale, people are becoming increasingly distanced from nature. Fewer opportunities to encounter nature mean that the benefits of engaging with nature are often not realised by urban residents. In response to this, there is a growing number of initiatives that aim to connect people with nature, for the benefit of individuals, communities and nature conservation. However, in order to maximise these benefits, it is important to understand the potential transformative effects for participants, both on a personal level and in terms of wider impacts.

Aims. In this study, we evaluate the social outcomes of a participatory wildlife conservation project in an urban area in north-east England, using hedgehogs as the focal species.

Methods. Based on an approach of community volunteers working alongside scientific researchers in an evaluation of hedgehog urban habitat use, we examine the transformative effects of this involvement at the individual and community levels via qualitative semi-structured interviews with community volunteers.

Key results. Participants were motivated by personal wellbeing factors such as enjoying proximity to the study species, learning and social factors. Participation in the study itself indicates a degree of motivation for engaging with a study of this sort. Nevertheless, involvement in the study was a successful vehicle for increasing participants' engagement with nature both during the study and potentially into the future, particularly in terms of biological recording and gardening for wildlife.

Conclusions. Participation in a wildlife study is a positive experience for many volunteers, leading to actual and potential changes in both personal and wider social outcomes.

Implications. Participatory initiatives such as the one described have an important role to play in signposting and supporting volunteers to follow future environmental aspirations and maximise the personal and social benefits associated with participation. This could be enhanced by ensuring that volunteering opportunities are linked in with pre-existing community-based networks which can act as advocates for environmental and wildlife conservation.

Additional Keywords: biological recording; citizen science; conservation; engagement; health; hedgehog; radio-tracking; volunteer; wellbeing.

Introduction

More than half of the world's population now lives in towns and cities (United Nations, 2008), and as urbanisation continues to increase, so will its impacts upon the environment and the people who live in these areas. One of the socio-cultural impacts of urbanisation is an increasing distance between people and nature (Katcher and Beck, 1987). For human residents of urban areas, opportunities to encounter wildlife can be limited since many of the residential areas of large cities typically contain lower levels of biodiversity (Turner *et al.*, 2004). Fewer opportunities to encounter nature will mean that the personal benefits associated with proximity to, or interaction with, wildlife and natural spaces will not be experienced by many urban inhabitants.

Simply being in the presence of nature has been linked to a sense of freedom, a sense of place (Bell *et al.*, 2004) and health benefits (Bratman *et al.*, 2012). Nature and natural environmental settings have been associated with various health benefits, including stress relief (Bird, 2004), longevity (Takano *et al.*, 2002), increased recovery rates for post-operative patients (Ulrich, 1984), decreased blood pressure (Hartig *et al.*, 2003) and improved wellbeing (Dallimer *et al.*, 2012). Participation in outdoor activities such as gardening or conservation activities can be beneficial to fitness levels (Bird, 2004) and children playing in a natural setting gain improved motor fitness (Fjørtoft and Sageie, 2000), as well as improvements in the behaviour of young people suffering from Attention Deficit Disorder (Taylor *et al.*, 2001). Individual benefits of interaction with nature may lead to wider, community-level benefits. For example, the presence and use of natural elements and green space can decrease stress (Grahn & Stigsdotter, 2003; Van den Berg *et al.*, 2010), increase levels of neighbourhood and personal satisfaction (Kaplan, 2001), lead to reduced crime and improved community cohesion (CABE, 2005), and reduce inequalities in mortality rates (Mitchell & Popham, 2008).

Experiences with nature, especially those early in life, affect people's environmental attitudes and their intention to participate in nature-based activities in the future (Nisbet *et al.*, 2009; Cheng & Moore, 2012). Linking personal and community level benefits may therefore help to engender positive changes in social attitudes towards wildlife. Such changes can also have significant ecological implications, since the pollution and disturbance caused by people, buildings and traffic in urban areas can make them challenging habitats for many species (McKinney, 2002, Parris, 2006, Baker and Harris, 2007, Gledhill *et al.*, 2008). A negatively reinforcing cycle of degrading biodiversity, decreasing individual environmental awareness and declining individual and community benefits may therefore develop. Reversing this negative cycle is a major policy challenge. Participatory urban conservation projects are one method which could contribute to

reversing this pattern, yielding both ecological and social benefits. However, their potential for bringing about such transformations remains largely untested.

The types of individual engagement with nature vary (Pretty *et al.* 2005). The key aspect which determines the extent of engagement is the type of activity pursued (Table 1). Thus, low-level engagement can be achieved by viewing or being in the presence of nature, whereas medium-level engagement requires some participation or involvement e.g. gardening for pleasure, making a trip to the woods to see bluebells, providing resources for wildlife e.g. feeding the birds. High-level engagement constitutes more active or 'hands-on' involvement such as wildlife gardening, involvement in citizen science projects and practical environmental tasks. Engagement with nature can also be considered in terms of its outcomes. For example, participation may illicit 'internal' outcomes for participants themselves such as: learning and skills acquisition; spiritual, physical and social benefits; meaning and satisfaction and mental health benefits (Lawrence, 2006, O'Brien *et al.*, 2008), which in turn may lead to community-level benefits.

Participation-based environmental initiatives are becoming increasingly common in many countries. One such initiative is citizen science, which involves volunteers collecting biodiversity-related or environmental information, which is then used in scientific projects by researchers (Tweddle *et al.*, 2012; Pocock *et al.*, 2014). Examples of large, well-established citizen-science projects include the Evolution MegaLab in Europe (www.evolutionmegalab.org), Project PigeonWatch in the USA (www.birds.cornell.edu/pigeonwatch), the Protea Atlas Project in South Africa (protea.worldonline.co.za), the Atlas of Living Australia (www.ala.org.au) and NatureWatch NZ (naturewatch.org.nz). Within the UK, several national-level citizen science projects exist including the RSPB Great Garden Birdwatch (www.rspb.org.uk/birdwatchbbc) and Open Air Laboratories (OPAL; www.opalexplornature.org/), with which this study was linked. In order to maximise the social benefits of such projects while maintaining their value in generating biodiversity records, it is important to understand how people engage with nature and the impacts this engagement can have upon them.

Some citizen science projects are 'collaborative', involving participants actively alongside researchers in the design, collection or analysis of the project, and a few are 'co-created', being designed collaboratively by scientists and participants (Tweddle *et al.*, 2012). However, most citizen science projects would be classed as 'contributory', with decisions about the activities being made by the 'central actors' or organisers (see Conrad and Hilchey, 2010, for a review) and the participants contributing data alone towards external goals or outcomes which benefit something other than the participant, such as organisations, wildlife or the wider community (Lawrence, 2006; Cooper *et al.*, 2007;

Silvertown, 2009; Rotman *et al.*, 2012). Citizen science projects may have significant benefits for biodiversity conservation (Devictor *et al.*, 2010). Through providing large quantities of empirical data across large areas, citizen science projects are starting to make real contributions to advances in fields such as global climate change, phenology, landscape ecology and disease dynamics (Dickinson *et al.*, 2010, 2012). Indeed, the scope and influence of such projects could be even greater if they could be coordinated across regional or even global scales to inform our understanding of global phenomena such as climate change (Bonney *et al.*, 2014). Notwithstanding their wider external benefits, citizen science projects can also generate considerable internal or personal outcomes for participating individuals or communities (Philips, 1982; Lawrence, 2006; O'Brien *et al.*, 2008). For example, the OPAL project strives to gather data about natural habitats, and encourage membership of conservation groups as external outcomes (OPAL, no date). Yet, at the same time, OPAL places a strong emphasis on internal and community outcomes, in particular encouraging engagement with, and learning about, nature, building community links and inspiring local people (Davies *et al.*, 2011).

Here, we evaluate the internal social outcomes of a collaborative wildlife conservation project in an urban area, conducted within the OPAL project, using hedgehogs as the focal species. Focusing on certain charismatic, “flagship” species as a vehicle upon which to engage an audience with conservation issues can be a successful tool for generating transformative effects, to the benefit of both individual and conservation organisation (Mainwaring, 2011; Kontoleon and Swanson, 2003). Using an approach of community volunteers working alongside scientific researchers in an evaluation of hedgehog urban habitat use, we examine the transformative effects of this involvement at the individual and community levels through qualitative semi-structured interviews with community volunteers.

Methods

The hedgehog study

Hedgehogs were chosen as the study species for this investigation because they are a conservation priority species in the UK (Battersby and Tracking Mammals Partnership, 2005; UKBAP, 2010), they are popular with the public and easy to recognise and observe. The study was conducted in Kingswood, a northern suburb of Hull, East Yorkshire. The study site was chosen as an area with a large population of hedgehogs, as revealed through a pilot household survey in the area (Hobbs, 2012). Nine hedgehogs were radio-tracked between August and October 2010 by survey teams consisting of scientific researchers and community volunteers working together to maximise data validity. The ecological objective of the hedgehog study was to understand patterns of habitat use by

hedgehogs within an urban environment, but its primary purpose in the context of this research was to provide a vehicle for the participatory study. All volunteers were trained in telemetry techniques and were given support in following the radio tracking methodology.

Recruitment of volunteers

Community volunteers were recruited through a mail-out advertisement linked to a previous survey, and through posters advertising the project which were displayed in local centres and shops. In total, fourteen 'community' (not working in science or environmental occupations or research) and ten 'scientific' volunteers (eight from the Universities of York and Hull, and two from environmental jobs outside of the two universities) worked together in the hedgehog study. Of the community volunteers, six were male and eight were female, 20% were under the age of 30, 60% between 30 and 50 years old, and 20% over 50 years old. Of the scientific volunteers, two were male and eight female, 90% were under the age of 30 and 10% were over 30 years old. Community volunteers participated on between one and four survey nights. Each night represented six hours of survey time and up to one hour of training and debrief. Two community volunteers participated on four nights, one person on three nights, one person on two nights and ten people on one night. This represented a total of 161 hours of volunteering from the community volunteers. In addition to these community volunteers, we also involved ten Youth Action Team members and four support staff for one survey night. The Youth Action Team is a community group consisting of 16-25 year old volunteers, who take part in a range of activities and promote volunteering in the region, as part of the national volunteering charity 'V' (Vinspired, 2009).

Interviews with volunteers

Following completion of the hedgehog study, community volunteers were contacted by email requesting their participation in the interviews, with follow-up emails sent twice to non-respondents. Eleven community volunteers who responded positively to this email were interviewed face-to-face or over the telephone, depending upon the circumstances and preference of the individual. Three community volunteers did not respond to emailed interview requests.

Although we requested to conduct face-to-face interviews with each Youth Action Team member, this was not seen as appropriate by the group leader due to time constraints. A mixed-method group-based question-and-answer session was therefore conducted after a Youth Action Team meeting. Seven Youth Action Team members participated in this activity. This method involved presenting questions orally to the participants, who responded in written format on individual answer sheets. It was hoped that this mixed approach would allow an exploration into individual changes rather than

group observations, whilst avoiding any influencing effects of dominant participants which can be a limitation of group interviews (Flick, 2009). In addition, by using this format rather than self-completed questionnaires to be taken away by participants, some of the difficulties associated with self-completion questionnaires such as comprehension issues (e.g. Bryman, 2008) could be overcome, and response rate maximised.

All interviews were conducted by the same researcher to minimise error due to interviewer variability (Bryman, 2008). Interviews were conducted in a semi-structured manner in order to maintain the informal relationship between interviewer and interviewee, and to encourage elaboration. Community volunteer interviews were recorded using a digital voice recorder, and transcripts coded and analysed using Atlas-Ti® (ATLAS.ti Scientific Software Development GmbH). Interviews were coded by working through transcripts within the context of each interview and identifying main points made, which were then grouped into key themes. Advertisement response data obtained from the interviews were analysed using SPSS v. 17.0 (SPSS Inc., 2008).

Interview guide

Semi-structured interview questions were centred on two main themes: (1) internal outcomes via motivations, benefits and negative aspects of involvement in the study, and potential changes in engagement with nature over time; and (2) external outcomes via perceived community or other benefits. Motivations and benefits of participation were investigated through informal conversational interview, with participants encouraged to elaborate within and beyond the themes wherever possible.

Changes in engagement with nature were explored using a visual participatory method, employing an 'engagement scale' on which participants were asked to position three stickers against a scale of 1-10 on a chart, to indicate their perception of their past, present and likely future engagement with nature. The concept of engaging with nature was explained at the beginning of the question, and confirmation of participant comprehension was sought before proceeding. In terms of time values, participants could assign their own timescale for past and future, but the concept of 'present' was set as the time when the volunteer was actively participating in the hedgehog study. For all participants, elaboration on their choices was encouraged.

In order to explore potential future changes in behaviour, five examples of real advertisements were presented in the interviews. The advertisements were used as a visual tool to focus discussions and to give real examples of environmental activity recruitment. Prior to asking for a response for each advertisement, the nature of the advertisement and the organisation running the scheme was explained to the participants. The advertisements were chosen to represent examples of three common approaches of

conservation organisations to increase participant engagement with conservation: financial contributions; wildlife gardening; and recording schemes and practical volunteering. These represent low, medium and high levels of engagement respectively (Table 1). Due to the high variability and number of wildlife recording schemes, these were split up into one at the higher involvement level (British Trust for Ornithology), and a lower level with less commitment (British Waterways). The advertisements are summarised below and a copy of each can be seen in the Supplementary Information.

1. British Trust for Ornithology (BTO) advertisement recruiting the public to participate in the Garden BirdWatch, a garden wildlife recording scheme. Participants for this scheme pay an annual fee to participate, and submit records on a regular basis throughout the spring and summer. It was explained to participants that other recording schemes exist that require differing levels of time and financial commitment.
2. British Waterways (BW) press article taken from a local newspaper (The Yorkshire Post). The article explains that a decline in numbers of kingfishers had been noticed as a result of the public providing records of wildlife upon their local waterways. It encourages people to join the free, *ad hoc* recording scheme.
3. Mammal Society (MS) membership advertisement. The nature of the society, its activities and the associated membership fees and benefits were explained to participants.
4. British Trust for Conservation Volunteers (BTCV) volunteer calendar for York region. This represented participation in practical environmental tasks such as scrub clearance and habitat management.
5. Wildlife Trusts (WT) 'Gardening for Wildlife' leaflet. This leaflet endorsed and gave advice on management practices that encourage wildlife into gardens.

Prior to the commencement of interviews, Social Research Association ethical guidance was consulted (Social Research Association, 2003), and methodologies were approved by a University of York ethics committee. Informed consent was obtained from all participants and personal information and responses were handled in accordance with the UK Data Protection Act 1998.

Results

Motivations for involvement

The types and number of volunteers involved in each stage of the study are shown in Table 2. None of the fourteen community volunteers had been involved in a wildlife radio tracking study before. Two of the 11 volunteers interviewed were currently engaged in

environmental volunteering in some respect, and another had been involved in environmental projects in the past. Reasons for getting involved in the study were centred around learning about hedgehogs, either in terms of managing their own gardens appropriately (two participants) *'we were feeding a group of hedgehogs in the garden, so if I get to know a bit more about them, it might help me to improve their chances'* (male volunteer), or to learn more about wildlife or hedgehogs in general (five participants). Two participants also stated that the social aspect of a community project was a motivating factor in their involvement and learning about radio tracking was a motivation for involvement for one participant. All 11 volunteers who were interviewed considered the process of being involved in the study to be positive, with ten of these saying that it was an enjoyable thing for them to do. Many participants used strongly positive language when describing their experiences, such as: *'sheer pleasure'* (male volunteer); *'it was great fun'* (female volunteer); *'it was a very enjoyable experience'* (male volunteer). Seven participants also explained that they would like to have been more involved during the study period, or would like to be more involved in the future; *'if you do a similar thing next year, we'll volunteer again, definitely'* (male volunteer).

All of the participating Youth Action Team stated that they became involved in the hedgehog study because it sounded interesting or exciting to do so. Four of these elaborated further, identifying an interest in hedgehogs and/or wildlife as a motivating factor.

Internal outcomes: personal benefits

Of the community volunteers, only one participant did not mention hedgehogs in relation to their own enjoyment or benefit as a result of the study, and some participants elaborated upon this by expressing positive emotions associated with being in close proximity to hedgehogs. For example, one volunteer expressed that she *'loved seeing the hedgehogs, they were amazing, and that was a real highlight'* (female volunteer), and another stated: *'I wasn't expecting to handle a hog, so I was delighted when I did'* (male volunteer). The process of radio tracking as an exciting and positive activity was described by three participants. For example, one participant described an enjoyable aspect of his involvement in the study as *'the chase, the crazy chase'* (male volunteer). One of the reasons that hedgehogs were chosen as a study species for this project was to enable participants to have close interactions with the species concerned, and this opportunity for hands-on experience was clearly perceived by the participants to be one of the most important benefits. Other wildlife species may not have offered the same experience or therefore the same type of benefits.

There were several different learning experiences described by the community volunteers. Learning about hedgehog behaviour and ecology was mentioned in some way by ten out of the eleven participants, the other being the volunteer who had been marking hedgehogs in their garden in this area over previous years. Some participants expressed surprise at aspects of hedgehog behaviour that they had learnt, as described by this volunteer: *'I think we learned...a lot about hedgehogs that we didn't know. We didn't think...for one they'd move as bloody fast as they did, and some of their little characters'* (female volunteer).

Despite the fact that all of the community volunteers learned how to use the radio tracking equipment and techniques for the first time, only five participants mentioned this when asked about what they had learnt. When prompted, the other participants agreed that they had learnt about these aspects, but did not elaborate further, giving the impression that this was not largely acknowledged as a significant learning experience. Two of the five participants also made a comparison with other radio tracking work they have seen on the television. Both stated that they had gained a greater understanding of what was involved in this type of scientific research as a result of their participation in the hedgehog study.

The social aspect of the project was described as a positive factor by eight of the 11 community volunteers who were interviewed. In particular, they liked the opportunity of meeting 'like-minded' people through their involvement. One participant identified that a positive aspect of their participation was learning from other volunteers; *'I had interesting conversations...and, it was nice...just having a group of people that were generally aware of wildlife, and had knowledge and interesting facts to impart'* (female volunteer). Another participant described how talking to other volunteers about her own experiences of hedgehogs helped her learn something about herself; *'I was surprised at how much I know...chatting to people...I sound as though I know a lot'* (female volunteer). Health benefits were touched upon by one participant who expressed that they thought they got physically fitter as a result of participation.

When asked about any less enjoyable aspects associated with their participation, three community volunteers identified the cold temperatures, three mentioned the late nights, and four identified sitting and waiting. Two volunteers reported that there were no negative aspects, and four of the volunteers who had identified less enjoyable aspects also qualified their explanation with a contrasting statement explaining their acceptance of the conditions as an integral part of the study. For example; *'I could accept the sitting around, because that must go with the territory'* (male volunteer).

When the Youth Action Team participants were asked about the enjoyable aspects of the study, four participants indicated that the physical process of tracking the hedgehog

was a positive part of their involvement. Two participants described enjoying using the tracking equipment. Three participants described some sort of social factor as enjoyable, whether it was meeting new people; *'some lovely people were met'*, or working within the existing group. One participant did not respond to this question. In terms of personal learning, four Youth Action team respondents mentioned that they had learnt about some aspect of how scientific studies are conducted, two of them elaborating that there was more involved than they expected. Personal benefits were described by two Youth Action Team respondents in more detail, one identifying *'needing patience'*, and the other stating *'I got more fresh air'*. Two other respondents indicated that they benefited by being interested in some aspect of the study.

For every Youth Action Team participant responding about less enjoyable aspects of this study (one participant did not respond), all described the associated physical discomfort, specifically the cold weather. Referring to a confrontation with some local residents, who challenged the group verbally in a slightly aggressive manner about what they were doing on the evening that the Youth Action Team was involved with the study, two participants also mentioned the *'awkward people'* as a less enjoyable aspect.

Internal outcomes: changes in engagement with nature

One of the community volunteers and two of the Youth Action Team members who were interviewed did not feel confident about applying score to their levels of engagement with nature over time. Scores of changes in engagement in nature over time were therefore recorded for 15 participants in total (Table 2). All participants indicated that their future level of engagement would be higher than their past engagement, and most participants indicated that their future level of engagement would be the same or higher than their present level (Fig. 1). Participants were not specific about the types of activities they envisage they will be involved with in the future, but there was a common desire to stay engaged with nature, or to become more so. For example, one participant explained: *'I'd like to have it more built into my life that there was a kind of routine...whether it's sort of a hobby or...definite volunteer work with wildlife'* (female volunteer).

External outcomes: community-level or wider benefits

The two community volunteers living within the hedgehog study area communicated that there were benefits of the study on a community level. Both of these were centred on the discovery that other people in the local community are also engaged by the local hedgehogs in some way as themselves: *'we talked to people locally...and we were actually finding that yes, people were actually finding hedgehogs, people were putting food out for them'* (female volunteer) and *'I got to see that local...sympathy for the hedgehogs was*

brilliant, the number of people that were...interested in actively feeding them and helping them, I thought was great, it was really...encouraging' (male volunteer). Another participant who volunteered as a Girl Guide leader said that she would pass on her new knowledge and experience to other groups in her local community, specifically the Guides that she works with. In this way, she reported that her own learning as a result of her participation was also a community benefit. Only two participants described that their involvement in the study might benefit something other than themselves, for example *'feeling like I was helping local wildlife in some way'* (female volunteer).

External values were not elaborated upon in depth by many of the Youth Action Team respondents. However one Youth Action Team respondent implied that there may be future external benefits by writing that involvement in the study had raised awareness of hedgehogs. Although there was no further elaboration, this comment suggests that the raised awareness is likely to be for the individual participant or the youth group. Another participant stated that their involvement in the study meant they *'did something useful with my time instead of spending it in the pub or at home watching TV'*. The word 'useful' implies that their involvement benefitted something beyond their own self.

External outcomes: Future behaviour changes

Responses to the advertisements showed that British Waterways and the Wildlife Trusts were the organisations that the largest number of participants were aware of, followed by the BTCV. The more specialist conservation organisations (the BTO and Mammal Society) were not known to the majority of respondents (Table 3). In terms of perceived changes in personal behaviour, there was an overall positive change from past into future for all activities (Table 3). Of all interviewees, only one participant indicated that there would be a negative change, i.e. having done an activity in the past and not being interested in doing it in the future. This was a Youth Action Team member, who indicated on their answer form that they had participated in a study like the British Waterways informal recording scheme in the past, but would not want to do it in the future. This answer was accompanied by their comment *'just not interested'*.

Response to the formal wildlife recording scheme, (e.g. BTO), was mixed. Although most (88.9%) participants had not undertaken this activity before, six (37.5%) would not be interested in doing it in the future, and ten (62.5%) would be, although four of these said that the fees associated with the BTO scheme would be a barrier to their involvement, preferring a scheme that is free of charge. One of these participants stated that they would not be confident enough in identifying birds to participate in this scheme, but they would be interested in similar schemes for other wildlife taxa.

Only two of the 18 respondents (11 community volunteers and seven Youth Action Team members) stated that they would not be interested in participating in the informal wildlife recording scheme. One of these is discussed above and the other was a Youth Action Team member who was not interested in participating in any of the environmental activities they were questioned about. Despite this high level of interest, 94.4% (17 participants) had not taken part in this activity before, even though more than half (64.7%) of all participants had heard of British Waterways before. This suggests that despite being aware of the organisation, participants were not aware of the wildlife recording scheme run by British Waterways, or of other similar recording schemes.

The activity with the highest proportion of people who have never undertaken it and would not be interested in doing so in the future was that of society membership (e.g. Mammal Society). Only one participant had been a member of a conservation society in the past, and this person was interested in continuing with this into the future. Of the 17 respondents who have not done this in the past, only six would consider doing it in the future. The reasons behind this were varied: three participants explained that they would be interested in taking part in surveys for this sort of organisation, but were not interested in joining; one participant stated that they *'like something more physical to do'* and another two explained that they would be put off by the money required to join, or stated that if they were going to donate money, a conservation organisation would not be their recipient of choice. Even amongst those who said they would be interested in becoming a member in the future, five of the seven participants commented that they would want to investigate in more detail where their money goes before committing to join. A high proportion (44.4%) of respondents had been involved with practical environmental tasks in the past (e.g. BTCV activity), and of those who had not, only one would not be interested in being involved in the future. This was the same Youth Action Team respondent who indicated that they would not be interested in doing any of the environmental activities in the future. Gardening for wildlife was the activity that most participants (55.6%) had done before in the past. Only one participant stated that they would not be interested in doing wildlife gardening in the future, and wrote *'don't have time or garden'* on their response sheet (Youth Action Team respondent).

Perceived changes in reaction as a result of participation

Through the environmental advertisements activity, all of the community volunteers expressed an interest in one or more of the activity types that they had not undertaken in the past. When asked whether they thought their reaction had changed as a result of their participation in the hedgehog study, seven participants agreed that they might be more likely to respond positively to some or all of the activities, four of whom specified that this

was due to increased or heightened awareness of opportunities rather than increasing their level of interest in activities like this.

Out of the seven Youth Action Team participants interviewed, one did not respond to the question asking if their reaction has changed as a result of involvement in the study. This respondent also indicated that they were not interested in any of the activities described. Of the others, four answered that their response may be, or was, different for at least one of the activities, and two wrote that there had been no effect.

Discussion

This study brought together community volunteers and scientists in an exploration of the social benefits of engagement in an urban wildlife conservation project. Where many other investigations of this type explore existing initiatives (e.g. Lawrence, 2006, Bruyere and Rappe, 2007), this study was designed and implemented specifically to address these questions. Although the sample size was relatively small, our study design enabled a high level of control over survey design and an in-depth understanding of individual motivations and views.

Internal outcomes

The interviews revealed that there have been self-reported internal outcomes for community participants. Internal benefits centred on personal wellbeing and satisfaction, particularly in terms of learning, social benefits and personal enjoyment. The majority of participants emphasised the benefits of learning about, and being in proximity to, wildlife in a way that was new to them. These internal values correspond to those reported from research with other environmental volunteers (Lawrence, 2006, O'Brien *et al.*, 2008). However in other studies, an altruistic factor of 'giving something back' was noted as a key motivational factor for participation (Phillips, 1982, Hibbert *et al.*, 2003, Martinez and McMullin, 2004), which was only acknowledged by three (<30%) of our volunteers, and not stated in the initial response to benefits of being involved in the study. This is perhaps indicative that participants did not link the objectives of the study with being beneficial to wildlife, or that they did not recognise their role as beneficial in some other sense.

Other than those participants already engaged in environmental activities, all interviewees expressed that involvement in the hedgehog study corresponded with an increase in their own engagement with nature from past to future. Although the motivation for a higher engagement with nature in the future may already be present in many volunteers, this suggests strongly that environmental activities such as the hedgehog study do encourage and enable participants to increase their engagement with nature. The majority of volunteers interviewed in this study also expressed a key benefit as being in

proximity to, or learning about hedgehogs themselves indicating that, as in other cases (Mainwaring, 2001, Kontoleon and Swanson, 2003, Home *et al.*, 2009), use of this charismatic flagship species was also a successful engagement tool in this study.

External outcomes

One of the external outcomes of this study, and others like it, is that of the successful collection of scientific data (Lawrence, 2006; Silvertown, 2009). However it is important to consider potential further external outcomes. Although expressing an interest in an environmental activity through an interview does not automatically mean a participant will go on to actually participate, by learning about new opportunities, participants will have experienced a change in awareness. This awareness change constitutes an internal outcome, which may lead to future external changes or future commitment to the environment in one form or another (Lawrence, 2006), even though changes in awareness, knowledge or education are not necessarily linked to changes in behaviour (Kollmuss and Agyeman, 2002, Lawrence, 2005). An assessment of whether real changes in engagement and behaviour have occurred would require a series of follow-up interviews several years after the activity was undertaken.

As well as the potential indirect internal community benefits, external community-level benefits were described by the two participants currently living in the study area, specifically in an increased understanding of the motivations and behaviour of other community members. Volunteers place considerable value on the social relationships they establish through their volunteering activities (Bell *et al.*, 2008), and research has indicated that where more extensive social networks exist, communities can come together to deal more effectively with natural resource management problems (Bodin and Crona, 2009). It may be concluded therefore that if more local community volunteers had been recruited from the study area, further community-level benefits, such as wider social networks and enhanced community cohesion (CABE, 2005), may have been realised.

The majority of participants reported that their reaction to the environmental activity advertisements had changed as a result of involvement in the wildlife study. As expected by the limited scope of the study, participants did not express a particularly strong reaction change, specifying that their participation in the study served to increase their awareness of activities, rather than making them more interested in participation in the first instance. Indeed, by participating in the study, the volunteers had already demonstrated their motivation for participation in a wildlife-related activity. Nonetheless, the majority of participants had not taken part in this sort of study before, so any potential increase in future participation as a result of their involvement could be viewed as a positive change.

The most popular environmental activities for the future were that of informal recording schemes and wildlife gardening, both representing a mid to high engagement level based on our classification. The least popular activity was that of society membership, classified as low-level engagement. This is a positive outcome as the higher-level engagement activities are also linked more closely to external outcomes in terms of benefits for conservation.

More notable was the overall positive response towards the environmental activity advertisements. Although many of the activities had not been known to the participants, many expressed an interest in participating in the future. The very fact that participants were not aware previously of these opportunities highlights another transformative outcome of the hedgehog study. The researcher's role in signposting other environmental opportunities to volunteers appears to have brought about a more significant potential behaviour change than that of running the study itself. A key barrier to participation in environmental activities is that of a lack of awareness of opportunities (Hibbert *et al.*, 2003, Martinez and McMullin, 2004) and it is clear from our data that linking volunteers with other activities could play an important role in overcoming this.

This signposting role has the potential to be even more important, as illustrated in this instance with the Youth Action Team. From the responses of interviewees, it was apparent that the environmental conditions associated with the study were a significant negative aspect for many of the participants. However, despite this, the group members' overall response towards the environmental activity advertisements reflected that of the other community volunteers, in that many expressed an interest for participating in activities in the future, having not participated in the past. This implies that there may be transformative effects for participants in other activities through increased awareness of opportunities regardless of whether the initial activity was an enjoyable experience for volunteers.

The hedgehog study was clearly a very intensive way of engaging volunteers to investigate potential transformative influences of participation. The requirement of this study for volunteers to work at night required a greater commitment from volunteers than for many other opportunities for nature-based volunteering, and is likely to have made recruitment more difficult. Working in such an intimate way with volunteers is not likely to be practical for many organisations, due to constraints such as staff time and financial implications. Despite this, the lessons learnt can be applied more generally to lower-intensity engagement exercises. For example if conservation organisations can enable volunteers to increase engagement with nature, particularly via charismatic species, and they can emphasise these factors in their volunteer recruitment mechanisms, this may be an effective way of engaging with potential participants. Using charismatic or flagship

species is known to be a successful mechanism to maximise engagement (Kontoleon and Swanson, 2003), and it is clear from the positive responses of volunteers in this study that the hedgehogs themselves were a key component in engaging these new participants in environmental activities. Of course not all wildlife monitoring studies can have a focus on flagship species (Bowen-Jones and Entwistle, 2002, Verissimo *et al.*, 2009) yet even species considered to be traditionally uncharismatic can gain public support when they are understood to be important in the local context (Bowen-Jones and Entwistle, 2002, Home *et al.*, 2009) or are of particular conservation concern (Verissimo *et al.*, 2009). However in studies such as this which aim to recruit new participants into intensive ecological study, using a charismatic focal species is likely to maximise their success (Leader-Williams and Dublin, 2000).

Local level studies that target participant recruits from the local community are also likely to lead to benefits on the community level as well as personally for individuals through social factors. Finally, by setting up mechanisms to communicate further participatory opportunities to volunteers as an intrinsic part of running environmental activities, organisations will maximise potential future involvement by volunteers.

Implications

Participation in a wildlife study is a positive experience for many volunteers, leading to potential changes in both internal and external values as a result. The wider role of participatory initiatives such as the one described here is likely to be especially significant in the context of signposting and supporting volunteers to follow future environmental aspirations in order to fully maximise the benefits associated with participation. A more joined-up approach could be maximised by linking volunteering opportunities in with pre-existing community-based networks. For example the church, schools and health service are likely to be community networks that are accessed regularly by a proportion of any community. In addition, key individuals that are linked with these existing networks may be known and trusted by the local community. Therefore, accessing these key people to act as advocates for the conservation message as well as information points for volunteering opportunities may be a successful approach in raising awareness and engaging with local people.

As urban wildlife conservation continues to grow in importance for wildlife, individuals and communities, participatory initiatives have the potential to make a significant impact upon its success. Therefore, it is essential to understand how to increase participation and accessibility in these initiatives in order to fully maximise the benefits associated with them. As discussed above, lessons learnt from this study should be

applied in a practical way by conservation organisations that aim to maximise the potential benefits of engaging with volunteers in environmental activities.

Acknowledgements

This study was part of the Open Air Laboratories (OPAL) project, which was funded by the Big Lottery. We are also grateful to Marfleet and Alderman Cogan primary schools, and members of Marfleet and Greatfield public meetings for their support. For promotion of the hedgehog tracking study, we thank the children of the Freedom Centre nursery for their beautiful “hand hog” which helped to promote the project, as well as Anna Hawksley and Esme Woods who helped on promotional stands in Hull. We are grateful to Hull City Council for their support, and especially to Nikki Hewitt for enabling night time access to cemeteries, and Jen Hunt, who gave access to parks both for hedgehog hunting and promotion of the project. We are especially grateful to the hedgehog volunteers who gave up considerable amounts of their time and sleep to contribute to the study, and to the Jennison family, who made an invaluable contribution to the project by allowing us to tag the hedgehogs in their garden as well as volunteering in the radio tracking.

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Figure legends

Fig. 1. Participants' perceptions of their changes in engagement with nature over time, on a scale of 0 to 10. Participants were asked to define their own concept of past and future, with the present being defined as the time at which they were actively involved in the hedgehog study.

Table 1. Examples of common approaches of conservation organisations and projects with the aim of increasing participants' engagement with nature. The level of engagement required for the activity is described based on the definitions described in the text. ¹BTCV (2011). accessed January 2011, www.btcv.org.uk/greengym. ²Blue Gym (2011), accessed February 2011, www.bluegym.org.uk ³Walking for Health (no date). accessed January 2011, www.wfh.naturalengland.org.uk

Type of engagement activity	Example	Potential outcomes		Engagement Level
		Internal	External	
Awareness Raising	Poster advertising the work of an organisation.	Learning and awareness: may influence behaviour through knowledge acquisition	No immediate although may lead on to higher external outcomes in future e.g. membership	Low
Financial Contribution	Membership of an organisation. Does not require any physical engagement with nature but still has benefits for organisation and therefore wildlife.	Possibly internal benefits; e.g. meaning and satisfaction. Learning and other internal benefits if receive information as part of membership	Financial contributions from public essential for many organisations.	Low
Fitness/ health based initiatives	E.g. Green Gym ¹ , Blue Gym ² , Walking for Health ³	Personal and community health. Social benefits. Linked benefits for health organisations/initiatives.	No obvious direct external outcomes	Mid
Wildlife Gardening	Benefits for wildlife but no data input into species monitoring.	Health and wellbeing, meaning and satisfaction, mental and spiritual	Gardens increasingly important habitats for many species.	Mid
Wildlife watching (informal)	Learning different species and actively watching wildlife for personal benefits (records not submitted)	Health and wellbeing, learning and skills acquisition, mental and spiritual	May lead to external conservation benefits if involvement formalised in some way, such as submission of sighting records	High
Biological recording schemes	Learning about different species and habitats, and scientific approaches to data collection	Health and wellbeing, learning and skills acquisition, mental and spiritual	Direct conservation benefits, contributing to status assessments	High
Volunteering and working holidays	Learning about different species and habitats, carrying out active conservation work such as habitat management, monitoring and recording species and habitats	Health and wellbeing, learning and skills acquisition, mental and spiritual	Direct conservation benefits	High

Volunteer warden and ranger programmes	Carrying out work on nature reserves such as habitat management, managing other volunteers and leading nature walks and holidays	Health and wellbeing, learning and skills acquisition, self-confidence	Direct conservation benefits, encouragement of other volunteers	High
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Table 2. Community volunteers and Youth Action Team members involved in different stages of the study.

Stage of study	Type of participant	Number of participants
Hedgehog radio-tracking study	Community volunteers	14
	Scientist volunteers	10
	Youth Action Team	10 (with 4 support staff)
Follow-up interviews	Community volunteers	11
	Youth Action Team	7
Engagement scoring activity	Community volunteers	10
	Youth Action Team	5

Table 3. Summary of volunteer responses to advertisements. The table summarises whether participants reported that they had heard of the stated organisations before, whether they have participated in the advertised activity in the past, and whether they would be interested in doing so in the future. BTO, British Trust for Ornithology; BW, British Waterways; MS, Mammal Society; BTCV, British Trust for Conservation Volunteers; WT, Wildlife Trusts.

Activity name	Heard of organisation? (n=17)			Done activity before (n=18)		Interested in the future (n=18)		Future interested from those who have done activity before		Future interest from those who have not done activity before	
	Yes	No	Not Sure	Yes	No	Yes	No	Yes	No	Yes	No
Formal recording scheme (e.g. BTO)	6 (35.3%)	11 (64.7%)	0	2 (11.1%)	16 (88.9%)	12 (66.7%)	6 (33.3%)	2 (11.1%)	0	10 (62.5%)	6 (37.5%)
Informal recording scheme (e.g. BW)	11 (64.7%)	4 (23.5%)	1 (5.9%)	1 (5.6%)	17 (94.4%)	16 (88%)	2 (11.1%)	0	1 (100%)	16 (94.1%)	1 (5.9%)
Society membership (e.g. MS)	2 (11.8%)	15 (88.2)	0	1 (5.6%)	17 (94.4%)	7 (38.9%)	11 (61.1%)	1 (100%)	0	6 (35.5%)	11 (64.7%)
Practical tasks (e.g. BTCV)	10 (58.8%)	4 (23.5%)	2 (11.8%)	8 (44.4%)	10 (55.6%)	15 (83.3%)	3 (16.7%)	8 (100%)	0	7 (70%)	3 (30%)
Gardening for wildlife (e.g. WT)	14 (82.4%)	3 (17.6%)	0	10 (55.6%)	8 (44.4%)	17 (94.4%)	1 (5.6%)	10 (100%)	0	7 (87.5%)	1 (12.5%)