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The Transformative Power of Engaging in Urban Greening Projects

Community greening efforts can improve urban ecological health, but what impacts do they have upon local residents' environmental attitudes and actions. Research suggests that the success of urban tree planting and other improvements require the stewardship of local residents, particularly in the face of dwindling public investment in green spaces. This study looks at the notion that participation in urban greening projects may have as much to do with helping inner-city residents' sense of community, connection to place, and empowerment, as improving ecological health.

The study involved an evaluative survey of participants in environmental stewardship projects in Boston. This pilot study asked a range of items related to participants' environmental knowledge and changes in their environmental attitudes and behaviors after volunteering. The study results found an increase in participants' willingness to engage in environmentally beneficial behaviors in their own yard, including planting or maintaining street trees; as well as increased sense of community. In addition, participants in these community-centered urban greening projects, which included street tree planting and community gardens, expressed a greater willingness to take action to address other community issues. The study provides insights for those engaged in increasing valuable urban green space while at the same time interested in the broader issues facing inner-city neighborhoods.

Keywords

Environmental stewardship, urban forestry, volunteer attitudes, place attachment

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INTRODUCTION

Community greening efforts can improve urban ecological health, but what impacts do they have upon local residents' environmental attitudes and actions? Research suggests that the success of urban tree planting and other improvements require the stewardship of local residents, particularly in the face of dwindling public investment in green spaces. This study in Boston, Massachusetts looks at the notion that participation in urban greening projects may positively affect inner-city residents' sense of community, connection to place, and empowerment, as well as improve ecological health, while creating much needed green space and tree canopy in underserved communities.

LITERATURE REVIEW: MOTIVATIONS FOR ENGAGING IN ENVIRONMENTAL STEWARDSHIP

Community engagement with urban greening projects has become a central tenant for improving the environment within urban neighborhoods (Krasney and Tidball 2009). This is particularly true in neighborhoods that lack the resources --- political, economic, and social capital --- to address the lack of green space within their communities. Moreover, economically strapped municipal governments continue to rely on volunteers and neighborhood groups to maintain existing green spaces, plant new urban trees, and create and maintain community gardens (Krasney and Tidball 2009). From a practical standpoint, neighborhood stewardship of urban trees is vital for their survival beyond the initial planting, whether by local residents or government agencies (Dwyer, 1997). Street trees require watering, pruning, and other maintenance. This same degree of stewardship is needed for urban parks and green spaces, particularly those which have been created by local residents.

The volunteering movement is alive and well in many American cities. For example, the Boston Natural Areas Network oversees and coordinates community gardens in Boston where over 10,000 local residents garden, as well as administers the City's Grow Boston Green project that aims to plant 100,000 new trees in the city (<http://www.bostonnatural.org>). These volunteer efforts aid the City of Boston Parks Department, which planted a total of 1501 street trees during 2010 according to the Mayor's Performance Report.

Volunteering activities include a range of work including clean-up of vacant lots, parks, and streams; planting of trees, community gardens, and other plants; and plant maintenance and care. Although not the focus of this study, urban environmental stewardship activities also include citizen science projects such as vegetation sampling, bird counts, and water quality monitoring. As outcomes, these environmental stewardship projects have tangible benefits for urban ecosystems; however, less is known about why local residents participate in such projects, and if their participation leads to changes in their environmental attitudes and actions.

The volunteer motivation literature suggests that initially volunteers in ecological restoration and urban forestry programs are motivated by the desire to help the environment and to learn more about ecology (Westphal 1993; Still and Gerhold 1997; Grese et al. 2000; Ryan et al. 2001; Moskell et al. 2010). Learning about nature has the quality of fascination, as described by Kaplan and Kaplan (1989) that sets environmental stewardship projects apart from other types

of volunteer efforts (Miles et al. 1998). These motivations held true for long-term volunteers as well, who were also motivated by the social benefits/ interactions that were part of their volunteer work (Ryan et al. 2001). Project organization (i.e., being part of a well-run program) also positively influenced whether participants became committed, long-term volunteers. The tangible rewards from hands on projects where participants could see visible improvements to the environment were also strong motivations (Grese et al. 2000). Kaplan and Kaplan (2009) describe the desire of people to take meaningful action to be an important motivation underlying many human activities, including environmental stewardship (Miles et al. 1998).

Place attachment, the emotional connection between people and place (Shumaker and Taylor 1983) is another reason that participants may volunteer in environmental stewardship programs (Ryan 2005; Ryan et al. 2001). Local residents' connection to place is the linchpin to engage in the strenuous activities needed to transform neighborhoods struggling with disinvestment (Ryan and Buxton, in press). Conversely, the act of engaging in environmental stewardship projects may increase participants' attachment to the local environment, particularly the natural areas where they volunteer. The nurturing aspects that come with community gardening, tree planting, and other greening projects may help build stronger connections to place as part of these transformational activities.

Place attachment underlies many of the conflicts and negotiations around urban planning decisions as epitomized by the "Not in My Backyard" (NIMBY) phenomenon (Ryan 2005; Manzo and Devine-Wright 2014). In addition, several studies have shown that volunteering in environmental stewardship has been found to be associated with increased environmental advocacy, and changes in environmental attitudes (Ryan et al. 2001; Ryan 2005).

A recent pilot study of New York City's Million Trees project found that urban forestry volunteers were motivated by the perceived environmental benefits of trees and community service (Moskell et al., 2010). However, few studies have focused on the topic of urban greening. Moreover, Moskell and others (2010) looked at the antecedents or motivations for volunteering rather than on the outcomes or benefits that volunteering has for those who participate, which may be key for volunteers continued participation in these projects. Moskell and others (2010) reviewed the literature on urban forestry volunteering and note that other researchers have hypothesized that volunteering will lead to community-level outcomes including increased community capacity (Elmendorf 2008), and citizen groups that are organized to address larger community issues (Bloniarz and Ryan 1996; Westphal 2003). However, few researchers have studied these potential outcomes in urban forestry programs (Sommer et al., 1994; Summit and Sommer 1997).

The focus of much of the growing environmental stewardship literature has been on ecological restoration projects with less focus on inner-city or central city neighborhoods (Dresbach 1992; Grese et al. 2000; Ryan et al. 2001). Thus, there is a need to understand if these same motivations hold true for inner-city residents engaged in urban greening projects, where there is much less literature particularly on urban forestry volunteers (Moskell et al. 2010; Still and Gerhold 1997). Moreover, the small number of studies needs replication to determine if these motivations are seen in other geographic settings, and with different urban populations.

The need for increased urban green space and tree canopy is essential as the pace of urbanization and its impacts on the planet continue exponentially (Birch and Wachter, 2011). However, simply developing new urban parks, planting new trees, and restoring urban ecosystems cannot be achieved by government action, even if resources were not an issue. Research continues to show that urban parks and natural areas need stewardship by local residents to survive over time (Colding et al. 2006; Ryan 2006). Vandalism, degradation of parks, urban tree mortality, all point to the need for urban residents' continued engagement in the appreciation, care, and advocacy for urban nature in its many forms. Moreover, initial research suggests that those green spaces created, planned, and even installed by local residents have a much higher likelihood of success than those that are developed through a top-down, government-focused approach (Colding et al. 2006; Jack-Scott et al. 2013).

In order to understand this relationship between environmental stewardship and urban greening, we developed a study in the City of Boston, Massachusetts to understand the following questions:

1. How does participation in community greening projects and related environmental volunteering affect urban residents' sense of community, connection to place, and sense of empowerment?
2. Does this participation lead to changes in environmental attitudes and actions?

Uniqueness of this Study

This study was unique in that it focused on urban greening volunteers rather than those working in rural or suburban natural areas. In many instances, the urban greening projects occurred in the low-income, ethnically diverse neighborhoods of Boston. Moreover, these pilot survey results were triangulated with other data sources, including interviews with volunteer leaders, and site observations to further understand the transformational aspects of volunteering in urban greening projects.

METHODS AND SAMPLE

Survey Instrument

The study used a survey instrument that was divided into three sections. The first section asked participants about their volunteering experiences including their level of activity and leadership role; organizations where they volunteered, types of activities in which they engaged, and their frequency and duration of volunteering. The second section of the survey asked them about their environmental knowledge or experience related to gardening and tree planting/ maintenance, as well as natural history knowledge. This section also included two questions related to changes in participants' environmental attitudes and actions before and after volunteering in stewardship activities (based on Ryan et al., 2001; Ryan, 2005). The third section of the survey instrument focused on demographics including gender, age, length of residence, race/ethnicity, language spoken at home, and educational attainment.

Distribution of Survey

The on-line survey link was e-mailed to participants in a variety of urban greening and other environmental organizations in Boston, including the Urban Ecology Institute's City Roots program and Boston Natural Areas Network. Since these list-serves can have multiple respondents, it was difficult to calculate a total distribution list or response rate. A total of 68 surveys were completed. However, 16 respondents (24%) indicated that they had never volunteered with these groups, suggesting that they were members only. Of the remaining participants, 27% indicated that they had volunteered in the past, 33% were active volunteers, and 10% were leaders of volunteer groups.

The survey participants were predominantly female (69%) versus male (31%). The mid-point for age distribution of the sample was the 40's (40.8%) with a rather balanced distribution, 18.4% in their 30's and 50's, respectively; 12.2% in their 20's; and the remaining 10.2% over 60 years of age. The sample was more predominantly white/ Caucasian than expected (76.6%) with the balance being black/African-American (17%), and Hispanic/Latino and mixed-race (6.4%). The sample was highly-educated with 90% having graduated from college, and the remaining 10% having graduated from high-school. Employment status was also high: 84% of participants were employed outside the home, 6.8% employed at home, and only 6.8% unemployed seeking work. The study participants varied in their length of residence in their current neighborhood with the majority being in the low to mid-level: 36.7% under 5 years of residency, 32.7% between 5-10 years, 6.1% between 10-20 years, and 24.4% over 20 years.

Comparisons to the general Census statistics for the City of Boston (U.S. Census, 2010) show that the sample is slightly less diverse with regard to the Hispanic/Latino population (17.5%) in the city as whole, and black/African American (24.4%); as well as more highly educated (city-wide stats are 42.8% college graduates; 84.2% high school graduates). The survey results should be viewed with these caveats in mind.

Data Analysis

The survey instrument was imported into "Survey Monkey" as the on-line format for participants to fill out. This program calculates percentage and average responses for the survey results. The data was then exported into the program SPSS 21 (IBM, 2012) for further data analysis. Initially, factor analysis was conducted on the survey items related to participants' behaviors and attitudes. However, the small sample size and strong correlation between the new factors led us to analyze each survey item individually. Independent samples t-tests were then conducted to explore group differences related to demographic variables, volunteer frequency and duration, as well as environmental knowledge. In addition, paired samples t-tests were used to look at before and after responses for the behavior and attitude items.

RESULTS

Frequency and Duration of Environmental Stewardship Activities

Within this survey we were also interested in understanding if there was difference between new volunteers and long-time volunteers. Four years was the median length of time that participants had volunteered with their respective environmental stewardship organization. Approximately 10.7% of the participants were brand new volunteers having begun during the past year, while about one-quarter (26.8%) were long-term volunteers with more than 5 years' experience.

There was also a wide-range in frequency that participants engaged in environmental stewardship activities. While about one-fifth (21.1%) volunteered once or twice a week and can be considered frequent volunteers, many more volunteered only once or twice a month (29.8%), or once or twice a year (35.1%). In fact, 14% had only participated once or twice ever.

We were also interested in the type of environmental stewardship activities in which participants were engaged in order to understand if there was any effect on the types of participation that were more transformational and/or were more associated with stronger commitment, as measured by frequency and duration. One question asked participants about how often they engaged in planting activities. On average, participants engaged more frequently in perennial and flower plantings (mean=3.08) than tree plantings (mean=2.48) or shrub plantings (mean=2.44) on a 5-point scale (1=not at all... 3=occasionally... 5=very often/regularly). This might be expected since tree plantings usually occur in springtime and are less episodic than other planting activities.

Participants were also asked their participation in other stewardship activities. The most frequent type of volunteer activities were trash clean-up (mean=3.14), plant maintenance or watering (mean=2.80), community gardening (mean=2.74), and brush removal/pruning (mean=2.54). Some participants were also engaged in supporting these organizations as committee and board members (41%; mean=2.31), and helping with office work and letter writing (mean=2.14). Less frequent participation was found in the volunteer activities of invasive species control (mean=1.93), plant identification (mean=1.64), wildlife/bird counts (mean=1.22), trail construction (mean=1.34), and stream quality monitoring (mean=1.25).

Environmental Knowledge

We were interested in the level of environmental knowledge or expertise that participants brought to their volunteer experience. Participants were asked "how much knowledge or experience do you have" from a list of items related to gardening, plant knowledge, and natural history using a 5-point scale (1=none at all...5=a high level). The average level of knowledge across all categories was below mid-level (mean=2.39) indicating less understanding of these issues than expected. This composite score for environmental knowledge was used in further comparisons on volunteers' changes in behaviors and attitudes. Participants indicated the highest level of knowledge about gardening (mean=3.31) and tree planting/maintenance (mean=2.76), which may relate to the type of activities in which they engaged as volunteers. Those items

related to natural history, including native plants (mean=2.37), local ecology (mean=2.14), local wildlife (mean=1.98) and bird identification (mean=1.78) were rated much lower.

Transformational Experiences

The central questions in this study revolved around the impacts that volunteer stewardship has on participants’ environmental actions and attitudes. The first question focused on self-reported changes in actions before and after participation in stewardship activities. The results from this set of four survey items (Table 1) showed significant changes for all measures. The survey results showed that this sample was already engaged in many general pro-environmental actions with the survey item, “I recycle, compost, and/or conserve water and energy at home,” receiving the highest levels of frequency both before volunteering (mean=4.16), as well as afterwards (mean=4.47).

When looking at actions directly related to environmental stewardship in their neighborhood, participants indicated that they were much more likely to water and/or prune the trees on their street or neighborhood after volunteering (mean=3.12) than they had before (mean=2.45), which is good news for the urban forest. They were also more likely to be engaged in community activism and outreach. Participants indicated very significant changes in their attendance or hosting of neighborhood gatherings since participating in stewardship activities (respective means, 2.82 (before), 3.38 (after)). Similarly, participants indicated that they helped their neighbors more since participating in environmental stewardship activities than beforehand.

Table 1. Changes in behavior before and after volunteering

For each statement below, please choose the response that best represents your experience BEFORE and AFTER participating in volunteer stewardship activities.				
	BEFORE	AFTER	DIFF.	T-TEST (sig. 2-tailed)
1) I attend or host gatherings in my neighborhood.	2.82	3.38	0.56	.001
2) I help my neighbors with tasks or will do a favor for them.	3.36	3.56	0.20	.05
3) I recycle, compost, and/or conserve water and energy at home.	4.16	4.47	0.31	.01
4) I water and/or prune the trees on my street or neighborhood park.	2.45	3.12	0.67	.001

Scale: 1=almost never 2=rarely 3=sometimes 4=often 5=very often

The second question asked about a wide range of environmental attitudes and actions including place attachment (derived from Ryan, 2005), knowledge about planting skills, and community advocacy. As in the results to the previous question, survey respondents self-reported positive changes after participating in volunteer activities for all the survey items; the vast majority which were statistically significant changes. However, the beginning point for their experience varied, as did the increase or change in their outlook or actions (Table 2). Five of the highly-rated survey items related to participants' attachment and pride that they have in their neighborhood or volunteer site. The survey results showed significant increases in their place attachment after participating in volunteer activities. Participants indicated a major increase in their attachment to the trees and parks in their neighborhood, rating this item the highest of any in this set (mean before: 3.57; after: 4.30 on the 5-point scale). Participants also indicated a significant increase in their sense of pride in their neighborhood or local park after they had participated in stewardship activities (mean=4.17) than beforehand (mean=3.26). Place attachment is also manifested in wanting to show one's neighborhood to others, which was also highly rated after participation in stewardship activities (mean=4.07). Using the theory of anticipated regret to understand place attachment (Baumeister et al. 2007), another item asked participants if they would miss their neighborhood or local park if they moved away, which was more likely after volunteering (mean=4.05). Volunteering was also associated with an increase in participants considering the site where they volunteer to be one of their favorite places (mean=3.56).

The second group of items related to increases in environmental knowledge that is useful for creating meaningful action in urban greening in one's own home and neighborhood. Participants indicated an increase in their confidence in planting, pruning, and maintaining their yard after volunteering (mean=3.86) than beforehand (mean=3.23). They also indicated knowing more names of a few native plants or tree species (mean=3.00); and even being able to explain the importance of ecological restoration after participating in volunteer activities (mean=3.16). These results suggest that volunteering transforms residents' knowledge about the natural world, and gives them some of the tools to convey this information to others.

The third group of items related to the community or social capital that environmental stewardship builds in a neighborhood. The survey results showed that participants know more of their neighbors by name after volunteering (mean=3.98) than beforehand (mean=3.27). Participants were also more likely to be a member of other civic groups in their neighborhood (mean=3.50), and even more importantly, felt that their neighborhood group has the ability to advocate for their community's well-being (respective means, 3.84 (after), 3.15 (before)).

As we found in our other research in these neighborhoods, perceptions of crime and fears for one's personal safety can significantly impact whether local residents are likely to use local parks and green spaces, and can impact the success of community gardens as well (Ryan and Buxton, in press). The current study showed that participants felt significantly safer in their neighborhoods after participating in urban greening projects (mean=4.07) than they had beforehand (mean=3.62), which is supported by studies in other cities (Branas et al. 2011). We surmise that the social connections formed as part of volunteering, as well as the increased sense of community physical care and pride, may have positively influenced residents' perceptions of safety.

Table 2. Changes in Environmental Outlook and Attitudes before and after Volunteering

For each statement below, please choose the response that best represents your experience BEFORE and AFTER participating in volunteer stewardship activities.

	BEFORE	AFTER	DIFF.	T-TEST (sig. 2-tailed)
1) I like to show my neighborhood to others (family, friends, etc).	3.47	4.07	0.60	.000
2) I can name a few native plant/tree species.	2.55	3.00	0.45	.001
3) I feel a sense of pride in my neighborhood or local park.	3.26	4.17	0.91	.000
4) I feel that my neighborhood group has the ability to advocate our community's wellbeing.	3.09	3.84	0.75	.000
5) I consider the site where I volunteer to be one of my favorite places.	2.67	3.56	0.89	.000
6) I can explain the importance of ecological restoration.	2.56	3.16	0.60	.000
7) I have an attachment to the trees/parks in my neighborhood.	3.57	4.30	0.73	.000
8) I feel safe in my neighborhood.	3.62	4.07	0.45	.000
9) I would miss my neighborhood or local park if I moved away.	3.30	4.05	0.75	.05
10) I am a member of other civic groups in my community.	3.05	3.50	0.45	.01
11) I would like to have a picture of my neighborhood or local park.	2.52	3.17	0.65	.000
12) I can confidently plant, prune and maintain my yard or neighborhood park.	3.23	3.86	0.63	.001
13) I know many of my neighbors by name.	3.27	3.98	0.71	.000

Scale: 1=not at all 2=a little 3=somewhat 4=quite a bit 5=very much

Group Comparisons

Paired t-tests were conducted in order to explore the differences between volunteers based on their volunteer frequency, duration, as well as demographic variables. We compared volunteers on their before and after scores, as well as calculated the change in ratings between the two scores to understand which type of volunteers had experienced the greatest change in attitudes and actions after volunteering.

Demographic variables including gender, ethnicity, and education level showed few differences. We also found no significant differences for the length of time participants had lived in their respective neighborhoods. However, the level of intensity and duration of volunteering did reveal some significant results. Those participants who had volunteered longer (more than three years) exhibited significantly greater change in attending or hosting neighborhood gatherings than newer volunteers (mean difference of 0.556 versus 0.412, $t=2.708$, $p<.05$). Long-time volunteers also indicated significantly greater change in watering and pruning trees on their street or in neighborhood parks (mean difference of 0.67 versus 0.47, $t=2.986$, $p<.05$).

Those that volunteered frequently (once or twice a month or more) were more likely to attend or host neighborhood gatherings after they had volunteered (mean=3.88) than were less frequent volunteers (mean=2.74, $p<.005$). They were also significantly more likely to help neighbors with tasks or do them a favor after volunteering (mean=3.96) than less frequent volunteers (mean=3.05, $p<.01$). Frequency of volunteering was also associated with significantly more changes in tree stewardship (i.e., watering and pruning street trees and park trees) (respective mean=2.44 before, 3.40 after; 0.96 change, $t=2.375$, $p<.05$) than did those who volunteered less frequently (respective means=2.21 before, 2.32 afterwards, 0.105 change).

Those indicating leadership positions in the volunteer groups had significantly higher responses to some survey items. Volunteer leaders indicated attending or hosting more gatherings in their neighborhood after volunteering (mean=4.11 after; $p<.05$) than did other participants (mean=2.90). Leaders were more likely to indicate helping neighbors with tasks and doing them a favor before engaging in volunteering (mean=4.11 before; mean=3.89, $p<.05$) than did other participants (mean=3.08). Leaders also indicated significantly greater likelihood of watering and pruning trees on their street or in neighborhood parks after participating in volunteering (mean=4.11, $p<.01$) than did other volunteers (mean=2.36 after).

Additionally, we found few significant differences in behaviors between those with different levels of environmental knowledge or expertise. This result may be attributed to the participants' low level of environmental knowledge. However, those that had a higher average self-rating of environmental knowledge about gardening and natural history indicated a significantly greater change in their attending or hosting gatherings in their neighborhood (respective means: 2.50 before; 3.43 after; 0.93 change, $t=2.044$, $p<.05$) than those with lower levels of environmental knowledge (0.25 mean change).

Group Differences: Environmental Behavior and Attitude Changes

The group comparisons for the wider range of changes in environmental behavior and attitudes (shown in Table 2) also found similar results. Demographic variables including education, gender, and race proved not to be significant differentiators in participants' responses to these items. Volunteer frequency did show many significant differences, but volunteer duration, the length of time that participants had been volunteering, did not. Those that volunteered twice a month or more frequently indicated significantly greater change in their confidence that their neighborhood group had the ability to advocate for their community (mean=2.92 before, mean=3.96 afterwards, change=1.16, $p<.05$) than did less frequent volunteers (mean=3.21 before, mean=3.37 after, change=0.16). They were also significantly more likely to know their neighbors by name after volunteering (mean=4.36, $p<.05$) than were less frequent volunteers (mean=3.42). These results show volunteering is associated with an increase in social networking and confidence in applying volunteer success to other neighborhood issues. More frequent volunteers also indicated greater changes in environmental knowledge, in particular, in their ability to explain the importance of ecological restoration (mean=2.64 before, mean=3.52 after, change=0.880, $p<.05$) than did less frequent volunteers (before mean=2.42, after mean=2.68, change=0.263). In addition, they indicated greater confidence in gardening practices (i.e., planting, pruning, and maintaining their own yard and neighborhood park) after volunteering (mean=4.08, $p<.05$) than did less frequent volunteers (mean=3.11). Thus, we might infer that volunteering increases environmental knowledge and competencies.

As might be expected, volunteer leaders indicated much greater increase or change in behaviors and attitudes than the overall volunteer group as a whole. This result is not surprising as leaders have dedicated significantly more time and effort to these projects. Volunteer leaders were significantly more confident that their neighborhood group has the ability to advocate for their neighborhood's well-being after volunteering (mean=4.56, $p<.05$) than did other volunteers (mean=3.23). After volunteering, they were also much more confident in their ability to maintain their own yard and neighborhood park (respective means=4.67, $p<.001$) and had a better ability to explain the importance of ecological restoration (respective means=3.89, $p<.05$) than were other volunteers (respective means=3.13 and 2.69). Volunteer leaders also indicated that after volunteering they had a stronger attachment to their volunteer sites (respective means=4.78, $p<.05$) and considered them their favorite place (respective means=4.44, $p<.001$) than did other volunteers (respective means=3.92 and 2.85).

Expertise in the form of environmental knowledge was less of a significant predictor of behavior than expected in the majority of categories. Not surprisingly those who self-reported higher levels of environmental knowledge indicated that they could name a few native plants before volunteering (mean=3.00) than did those with lower levels of knowledge (mean=2.11, $p<.05$), but there were no significant differences between the two groups after volunteering which suggests some increase in knowledge by the "non-experts." Those with more environmental knowledge also indicated significantly higher desire to have a picture of their local neighborhood or park after volunteering (mean=3.50) than were non-experts (mean=2.40, $p<.05$). Although this is one measure of attachment to place; other comparisons between the two groups on the attachment items were not significant.

DISCUSSION: LESSONS FOR URBAN GREENING PROJECTS

This study showed that environmental stewardship projects not only lead to ecological benefits (Strohbach, et al. 2013), they have profound social and well-being outcomes for the volunteers who participate, as well as the larger community where these activities occur. The study found transference from the environmental stewardship activity to participants' overall environmental outlook, actions, and knowledge. In other words, volunteer stewards took the skills and knowledge about tree planting and maintenance, native plants, etc. and applied them to their own home and neighborhood. These transformational qualities of participation in volunteer stewardship were found in previous studies in Michigan (Ryan et al. 2001). The current study expands this line of inquiry by looking at a more urban setting with a greater focus on urban tree planting projects.

The idea that participation in environmental stewardship projects, especially those focused on urban greening, can lead to larger community renewal projects has been discussed anecdotally in the literature (Romolini et al. 2012.). However, few studies have tried to look at the process which leads to these changes, and measure them empirically (Shandas and Messer 2008). Our study found that participation in environmental stewardship projects was associated with increased willingness to take action within one's own neighborhood. Participants were more likely to become environmental stewards of the trees in their own neighborhood and yard after their participation in urban greening projects. The fact that they also indicated an increase in their competency in planting, pruning, and maintaining their own yard, suggests that urban greening builds a set of skills, knowledge, and confidence that participants can use to take on future greening projects in their own neighborhood. In theory, this increase in environmental outlook and actions, may sustain further neighborhood greening after the initial volunteer projects and funding are completed.

Specifically, our study found changes in volunteers' environmental outlook and actions in the areas of knowledge, place attachment, and community building. The knowledge areas were in the practical horticultural skills needed to plant and maintain urban trees and plants, as well as knowing more about the native ecosystems, including the importance of ecological restoration, and identifying native plants and tree species.

Connections with Place, Connections with People

The study results support our hypothesis that participation in environmental stewardship projects increases urban residents' sense of community, connection to place, and sense of empowerment. Connection to place or place attachment, as it is described in the literature, may be a precursor for taking action within an urban neighborhood (Manzo and Devine-Wright 2014). Previous research found that place attachment is important for encouraging environmental activism to protect urban parks (Ryan, 2005). The current study expands this to the arena of urban greening/tree planting projects.

The idea that planting trees and other acts of urban greening can increase place attachment is a vital concept, especially in neighborhoods suffering from disinvestment and economic challenges. The study found an increase in sense of pride that participants had in their neighborhood after taking part in these urban greening projects. Place attachment can also be seen as a motivation to engage in projects in the first place, but the notion that participation also *builds* connection between people and place suggests a positive upward spiral in action and motivations that is needed to sustain long-term renewal of urban neighborhoods.

The social connections and community building aspects of urban greening projects are equally important as knowledge and skill building outcomes. Urban greening projects are generally group activities. In fact, previous research has shown that volunteers are motivated by social reasons, as well as opportunities to learn about and help the environment (Grese et al. 2000; Ryan et al. 2001). The current study also suggests that participation in urban greening projects strengthens social capital within a community. Participants were more likely to know their neighbors by name after being part of these volunteer activities. In addition, the study found increased environmental activism by participants, including increased membership in other civic groups in their neighborhood.

Motivating Environmentally Beneficial Behavior and Actions

One theoretical model that can help explain the psychological processes operating within urban greening projects is Kaplan and Kaplan's Reasonable Person Model (RPM; 2009). The RPM model describes the need to build people's mental models or cognitive maps about environmental issues or situations, to create opportunities for people to take meaningful action to address these issues, such as the lack of green space and trees in their neighborhood, and to build the competence or skill set to take action and solve problems. They describe the need for small experiments to address environmental problems before investing too much time and resources. Small experiments also allow flexibility to change the strategies and learn from each effort. The idea of adaptive management has been discussed in the urban ecology and forestry literature (Dwyer et al. 2003), and has this idea of small experiments woven through it (Walters and Holling 1990; Gregory et al. 2006; Kelly et al. 2012). Urban greening projects can be seen as those small experiments that help neighborhood groups build the capacity, and competency to address a range of neighborhood issues (Goldstone et al. 2013).

Limitations of this Study and Future Research

The study has several limitations that could be addressed with future research work. As a small-scale study, it was limited in the number of participants and the time-frame. Future research should look more longitudinally at volunteer's experience before, during, and after volunteering. The current study, although conceptualized as a pre-/post experiment was limited by time, as well as the drop in funding for the environmental stewardship project that resulted from an economic downturn. Thus, participants in this study self-reported changes in social and well-being outcomes rather than having the data gathered before and after volunteering as originally planned. In addition, future research is needed to expand this study to the Hispanic community and other ethnic groups who were less frequent participants in our study.

One of the issues that should be explored in future studies is the role of community-based volunteers, those who live in the neighborhood where the urban greening occurs, versus those who are members of the larger organization, but live in other parts of the cities. Environmental stewardship projects vary in the amount of local volunteers, who are planting trees or creating gardens in their own block/ neighborhood; and their larger volunteer base who work on projects throughout a city or region. In our anecdotal experience, we saw greater success/ stewardship in those projects that are truly community developed, designed, and implemented (Ryan and Buxton, in press). Previous urban forestry research suggests that planting projects conducted by local residents have a better chance of long-term stewardship than those planted by outside organizations (Austin, 2002; Austin and Kaplan 2003). However, the realities of implementing these projects suggests the practicality of having as many volunteer as possible, especially for the labor intensive installation phase of work. The ratio or proportion of local versus outside volunteers deserves further study in light of the many regional or larger urban tree planting initiatives, such as Grow Boston Greener, and New York City's Million Trees Project (Moskell et al. 2010).

CONCLUSIONS

The benefits of urban trees and green space to foster ecological health and address the challenges wrought by climate change, pollution, and increased urban populations are well-documented in the urban ecology literature (Dwyer et al 1992, 2003; Head and Muir 2006; Tidball and Stedman 2013). The social mechanisms that lead urban residents to become stewards and advocates for urban trees and green space are less understood. Some researchers suggest the need for a pro-environmental world-view as a precursor to action (Staats 2003; Greaves et al. 2013). However, we would argue for a more holistic approach that incorporates the range of human concerns (e.g., safe places to live, clean air, economic opportunities, etc.) that might lead local residents to take environmental action, such as planting trees and other green space.

The current study focused less on the motivation for becoming engaged in these activities, which has been the theme of much of the emerging literature on environmental stewardship (Westphal, 1993; Still and Gerhold 1997; Grese et al. 2000; Ryan et al. 2001; and Moskell et al. 2010). Instead, we addressed the outcomes of environmental volunteering for participants and their communities. One important outcome of participation in an environmental stewardship project is creation of a cadre of local residents who will become advocates and stewards of urban trees and green space that form the heart of urban ecosystems in densely populated cities. This outcome is not to be underestimated, especially in inner-city neighborhoods, where issues related to crime, poverty, environmental and economic injustices clamor to be addressed. The role of urban trees and green space to address the challenges of urban life has been suggested by many key public health and planning advocates and researchers (Coley et al. 1997; Frumkin 2001; Jackson 2003; Wells and Rolling 2012). Urban greening projects can be the centerpiece of urban neighborhood improvements that will foster a more sustainable and equitable future for all people.

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