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Environmental identity, pro-environmental behaviors, and civic engagement of volunteer stewards in Portland area parks

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We conducted surveys of adults participating in municipally sponsored volunteer events in the Portland, OR metropolitan area in order to understand the range of attitudes and behaviors associated with volunteer work. We sampled 172 individuals in 18 events from February to June 2012. Principal components and factor analyses of survey responses identified three groups based on annual frequency of participation in stewardship events: first-time volunteers, mid-level volunteers (3–10 events per year), and frequent volunteers (>10 events per year). Our analyses revealed three main factors that explained the variation in survey response for the three volunteer groups: environmental identity, private pro-environmental behavior, and civic engagement. All three factors were positively correlated with frequency of participation in stewardship events, with the most frequent volunteers indicating the highest degree of attention to environmental issues, environmental identity, and self-reported pro-environmental behaviors. Frequent volunteers were more likely to feel personally attached to their local environment, believe that their efforts help solve environmental problems, and enjoy being part of community efforts. These results suggest that stewardship activities provide opportunities for volunteers to interact with others while working collectively toward restoring and maintaining parks, which may contribute to more resilient communities.

Keywords: attitude; pro-environmental behavior; citizenship; environmental problems; nature

Introduction

Many urban people participate in stewardship activities in local parks, notably in Portland Oregon. An understanding of the attitudes and behaviors associated with volunteer stewardship at urban parks may provide insights into the sorts of learning opportunities stewardship organizations can provide for volunteers. Our research on environmental stewardship volunteer attitudes and behaviors is part of the Portland/Vancouver (PDX/VAN) Urban Long Term Research Area. Framing our research to understand the social and ecological feedback loops of an urban system, we studied the environmental stewardship of volunteers that ensues via informal learning settings in the metropolitan area. We hoped to understand any

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spillover effect among pro-environmental behaviors, how environmental identity might affect pro-environmental behaviors, and how civic engagement might provide a feedback loop promoting urban resiliency.

Volunteer restoration activities involve participants in active relationships with specific natural areas. A better understanding of these relationships is important because there are likely positive consequences, such as spillover of pro-environmental behaviors to other areas of community benefit, that are not well understood. For example, an active volunteering relationship may create a feeling of connection or attachment between the volunteer and a natural area (Ryan 2005; Schroeder 1998). Volunteers' contributions may contribute to developing a constituency for environmental protection and enhanced civic engagement among volunteers (Ryan, Kaplan, and Grese 2001). Volunteering in local parks may foster civic responsibility for environmental protection. Volunteer involvement in restoring or healing nature might help to deepen an existing environmental ethic (Leopold 1949).

We devised a questionnaire to investigate environmental attitude–behavior relationships attributable to stewardship. Environmental attitudes are defined as those that express concern or caring for the environment (Gifford and Sussman 2012). Pro-environmental behavior is defined as 'behaviour undertaken to preserve or improve environmental quality' (Manzo and Weinstein 1987, 674). More than just knowledge is necessary for people to become committed to pro-environmental behavior. Experiences in nature and participation in environmental organizations can be seen as more important to environmental commitment than formal education (Chalwa 1999). Prolonged engagement in stewardship may result in the development of personal interest in restoration (Claire 2003). The social interactions among frequent volunteers (Price and Lee 2013) may influence their attitudes and behavior. Attitudes might predict behavior when the level of specificity of the attitude matches that of the behavior, when social norms are perceived to support the behavior, and when the person thinks he or she can do the appropriate behavior (Ajzen 1991).

We identified three sets of attitudes and behaviors to investigate in our study. The first set of attitudes was environmental identity, defined as a 'sense of connection to … the natural environment that affects the way we perceive and act towards the world' (Clayton 2003, 45–46). Individuals with strong environmental identity reported significantly more ecological behaviors than those low in environmental identity, even when attitudes, values, and ideologies were held constant (Clayton 2003). In a study by Whitmarsh and O'Neill (2010), behavior-specific self-identity was seen to exert the strongest influence on intention to behave in pro-environmental ways. Individuals may undertake private sphere pro-environmental behaviors that seem to arise from strong place attachments, a component of environmental identity (Scannell and Gifford 2010). Vaske and Kobrin (2001) found that those with a greater sense of emotional place attachment reported engaging in more pro-environmental behaviors. We posited that environmental identity might shape how respondents answered the questions posed to them. Terry and Hogg (1996, 2000) found that attitudes are more likely to express themselves as behavior if the attitude (and associated behaviors) reflects the normative properties of a social group with which people identify. In addition, they demonstrated that social identity and group norms have more impact on the attitude–behavior relationship than other factors.

Place attachment is one aspect of environmental identity. Many volunteers develop an attachment to the site where they performed stewardship. Ryan (2005) found a significant relationship between volunteers' experience working in parks

and the degree of place attachment. Attitudes of attachment to a place may be linked to particular pro-environmental behaviors. For example, volunteers may increase their participation in pro-environmental behaviors due to their experiences in natural environments (Hartig, Kaiser, and Strumse 2007).

The next factor we investigated was behavior. We asked a block of pro-environmental behavior questions hypothesizing there would be a spillover effect from natural area stewardship to other behaviors. We used the term 'pro-environmental behaviors' assuming it encompassed any action taken on behalf of environmental protection from simple acts such as recycling to more complex actions like participating in restoration activities in public parks. The idea that taking up a new pro-environmental behavior might lead to the adoption of other similar behaviors has been termed 'spillover effect' by Whitmarsh and O'Neill (2010). There is some evidence that similar pro-environmental behaviors might be clustered in some way, such as with purchase decisions or habits (Whitmarsh and O'Neill 2010) and may be due to common motivation, context, or past behavior frequency.

Volunteer engagement in natural parks work facilitates gains for other social goals. We wanted to know about other pro-environmental behaviors volunteers who work in parks also engage in. We did not attempt to study this in a causal sequence, but wanted to understand the associations between stewardship and other pro-environmental behaviors. Stern's (2000) typology of pro-environmental behaviors was our starting point, encompassing both 'civic' behaviors that include petition signing; and private sphere behaviors like home recycling or reducing energy consumption. Civic participation was seen in the current study as an important aspect of a volunteer's overall set of pro-environmental behaviors; it may be linked to other pro-environmental behavior (Owen and Videras 2006).

Civic behaviors are aspects of civic engagement, here defined as behavior that addresses issues of public concern. Civic engagement can range from individual volunteerism to electoral participation, including efforts to directly address an issue, and working with others to solve a community problem (Ekman and Amnå 2012). Volunteering is believed to support a healthy democracy (Almond and Verba 1963). Civic engagement allows volunteers to find more meaning in life, to express their social identity, and contribute to the well-being of others (Clary et al. 1998). In our study, we asked about private sphere behaviors including removing invasive species from one's yard and public sphere behaviors including contacting local elected officials.

Another perspective in interpreting linkages among specific pro-environmental behaviors is social influence. Defined as 'psychological change brought about as a result of the behavior of other people,' social influence can be invoked by seeing others behave in pro-environmental ways and through normative influences (Gifford and Sussman 2012; Schultz and Kaiser 2012). Informal discussions may be a vehicle by which this operates by supplying normative influences concerning what the group of volunteers' value (Schultz, Tabanico, and Rendón 2008).

Although we acknowledge that past behavior exerted a significant and independent influence on intention, it was outside the scope of this study to determine which behaviors our participants had participated in prior to volunteering. Instead, we inquired about the frequency with which they had participated in park stewardship. Ryan (2005) found that volunteer participation frequency over time might have significant effects on participants' attitudes and behavior. Donald (1997) compared first time volunteers in an environmental organization with active members and

determined that differences between the groups developed after joining. His data suggest that organizational factors may play a role in determining how frequently a volunteer may participate. In our interpretation, his study also points to how membership in other organizations contributes to participants' pro-environmental behavior. We asked participants if they had volunteered for any other organizations.

Environmental literacy

Another construct studied focused on volunteers' environmental literacy. The concept of environmental literacy developed from myriad conceptualizations in environmental education including predictors of responsible environmental behavior, barriers to action, and environmental problem-solving (Hollweg et al. 2011; Hungerford and Volk 1990; Kollmuss and Agyeman 2002). The term, first coined by Roth (1968), was later operationalized into specific components: knowledge, skill, affect, and behavior. Roth defined environmental literacy as the capacity to perceive and interpret the relative health of environmental systems and take appropriate action to maintain, restore, or improve the health of those systems (Disinger and Roth 1992; Roth 1992).

Since then, several frameworks and definitions of environmental literacy have emerged. McBride et al. (2013) reviewed 16 different frameworks and concluded that environmental literacy, as it has been conceptualized over 40 years, involves affect, ecological knowledge, sociopolitical knowledge, knowledge of environmental issues, skills, environmentally responsible behavior (ERB), and additional determinants of ERB (i.e. locus of control). Review of these frameworks revealed differences in types of knowledge (ecological, sociopolitical, and environmental issues). McBride and colleagues (2013) did not specify between types of behaviors, behavior change being a central outcome of environmental education. Jensen (2002), however, discusses the differences between environmental behavior and environmental action. Environmental action is targeted at a change or solving a problem where environmental behavior is a larger term including not only environmental action but also investigations that may affect knowledge or attitudes like ecological research.

Environmental literacy can be viewed as a continuum having knowledge, affect (dispositions), skills (competencies), and behavioral components (Hungerford and Volk 1990; Roth 1992), all dynamically influencing one another. According to the North American Association of Environmental Educators, an environmentally literate person possesses knowledge and understanding of environmental problems issues and concepts; a set of cognitive and affective dispositions; a set of cognitive skills and abilities; and behavioral strategies to apply their knowledge to make effective decision in environmental contexts (Hollweg et al. 2011).

We adapted the environmental literacy model proposed by Hungerford and Volk (1990), bundling behavioral and attitudinal associations with volunteer frequency; this provided us with snapshots of particular characteristics of each set of volunteers. Our questions address environmental sensitivity, attitude, and concern towards the environment, assumption of personal responsibility, motivation, and intention to act and ERBs, both individually and collectively. Since our analysis of environmental literacy was *post hoc*, we did not include a well-developed measure of self-efficacy or locus of control, one item important to this model. This factor is an indication of an individual's level of self-confidence and personal empowerment and represents an individual's perception of whether he or she has the ability to bring about change through his

or her behavior (Hungerford and Volk 1990). Our questions were seen as indicators of locus of control, since they focused on the volunteer's feelings about their own ability to bring about effective action directed toward restoration of the environment. Although these questions do not adequately cover the construct of locus of control, their responses shed insight into relevant attitudes.

We endeavored to understand these snapshots in light of the informal environmental education experiences of these volunteers. The behavioral and attitudinal associations among levels of environmental literacy can provide informal environmental educators and program organizers with clues to direct their instruction, outreach, or assessment with the goal of retaining volunteers over the long term. Categorizing volunteers along a continuum of environmental literacy may inform decisions as to which volunteers might profit from leadership opportunities and which might need structured skill development.

Research questions

We designed and implemented a survey of adult participants in municipally sponsored volunteer events in the Portland, OR metropolitan area (which includes the city of Vancouver, WA), in order to understand the range of behaviors and attitudes associated with work in natural areas. Our main research questions were:

(1) Do attitudes of environmental identity predict pro-environmental behaviors?
(2) Is there a spillover effect between volunteering in parks and volunteer's private environmental yard behaviors?
(3) Are more frequent stewardship participants also more engaged in civic behaviors?
(4) Do patterns of attitudes and behaviors differ significantly between three groups of volunteers based on frequency of volunteering?

During our initial analysis, patterns among volunteers' behaviors and attitudes emerged according to the frequency of volunteer participation. Environmental literacy was added *post hoc* in analysis of our data to better characterize the attitudes and behaviors associated with environmental stewardship. The patterns that emerged aligned with some aspects of existing conceptualizations of environmental literacy.

Research methodology

Volunteerism in the Portland metropolitan area

There is a strong participation and stewardship ethic in the Portland/Vancouver metropolitan area (Civic Life in America 2010). The data in this report, collected by the Bureau of Labor Statistics and Census Bureau, showed that the PDX/VAN metropolitan area, with 36.2% adults volunteering, has the second highest rate of volunteerism for the 51 metropolitan areas surveyed. Some of the main drivers identified in the study were sense of responsibility for the public good, existence of structures and processes to facilitate community engagement, access to relevant information, and access to education. Berry (1993) ranked Portland third out of 15 cities in a ranking of 'community participation' from indicators of strong democratic participation. Participation in stewardship activities is widespread in this region. In the city of Portland in 2011–2012, approximately 63,000 volunteer hours were spent

in parks helping to remove invasive plants and replanting with natives (Rachel Felice personal communication 2012). We surveyed 172 volunteers from the PDX/VAN region about their environmental behaviors and attitudes. The volunteer programs had participants remove invasive species, plant native species, and improve soil conditions in parks.

Portland Parks and Recreation (PPR) and Vancouver-Clark County Parks & Recreation (VCPR) rely on volunteers to help protect and restore the natural environment. During natural area stewardship events, volunteers may help to build and maintain trails, clear invasive plants, plant native species, amend and improve the soil, monitor and identify endangered species, help publicize events, and help train new volunteers.

Our study

Our survey used structured response and two open-ended questions. Structured response questions included questions taken from the Environmental Identity Scale (Clayton 2003), questions about sense of place (Ryan 2005), questions about volunteer participation in pro-environmental behaviors, and a subset used in the Green Cities Alliance survey of stewardship conducted in the Seattle, WA region including an interest in leadership and interest in further education (Asah and Blahna 2012). In open-ended questions participants indicated what they received from their volunteer experiences and listed other organizations for which they volunteered. There were different sections of questions for first-time participants and for more frequent participants. Altogether, the questionnaire contained 48 questions including demographic questions: gender, income, education, and age. Behavior questions were organized into private behaviors, such as removing invasive species and planting natives in one's own yard and public sphere behaviors, such as contacting elected officials about parks and open spaces and willingness to serve in a leadership position (Stern 2000). Attitude questions were organized by major constructs (environmental identity, place attachment, and civic engagement). We also recorded the frequency with which they volunteered. Although we asked about frequency of volunteering over a given year, we equated those indicating they volunteered more than 10 times over a year as long-term volunteers, assuming that they had been volunteering for at least several years.

We sampled every unique volunteer event, one event per park site, for PPR and VCPR between February and June of 2012. We sampled only during this time period since it best coincided with our own academic year schedules. In order to sample volunteers without bias, we approached every other volunteer and asked if they would be willing to participate. It was not possible to sample every participant at these events due to time constraints; each event lasted only 2 h. Volunteers were given the choice of completing the survey orally while the researcher filled out the questionnaire or completing the survey independently while the researcher performed the volunteer work on their behalf. Altogether, we sampled 172 individuals over the course of 18 events, 50% of the population of 350 possible volunteers. The volunteer coordinators of PDX/VAN were interviewed regarding their ideas about the value of the program for participants and to provide information about how these programs originated. Attitude questions with multiple options were ranked on a 1–5 Likert scale. We held a follow-up focus group with very frequent volunteers one year after completing the survey to

further understand their backgrounds. Participants were asked what had initially drawn them to volunteer, and why they had continued to do so over time.

We considered frequency of participation in natural area volunteer events as our central variable. When we began to analyze our survey results and looked in particular at the frequencies of volunteer participation, volunteers fell into three distinct groupings. These groups were: (1) those for whom the event had been the first or second occasion for volunteer participation, (2) those who participated regularly between 3 and 10 times per year, and (3) those who participated in volunteer stewardship more than 10 times per year. Initially, we sorted our participants into these groups for practical reasons; we subsequently sought to verify this sorting using a PCA. We used a hierarchy of three levels of involvement for the utility to combine and scale different attitudes and behaviors meaningfully. We assumed that the frequency of participation in natural area volunteering provided a different intensity of experience for volunteers, either leading to or resulting from different sets of attitude and behavioral preconditions or outcomes.

We ran a factor analysis to designate constructs among our variables. Cronbach's α was calculated for each set of questions, with a .60 minimum set before collapsing individual questions into new sets of variables. To explore relationships between environmental identity and pro-environmental behavior, a Pearson's correlation was run. To analyze possible spillover effects between frequency of participation in park stewardship and private pro-environmental behaviors, Wilcoxin signed rank tests were also used to test for relationship between civic engagement and level of participation in stewardship activities and private behavior and frequency of participation. Kruskal–Wallis rank sum tests were used to compare frequency of participation with private behavior and civic engagement. The IBM statistical software SPSS was used to perform the above analyses. Generalized linear models were created with the statistical package R™ to examine how frequency of participation in stewardship might predict responses within our constructs of environmental identity, participation in private pro-environmental behaviors, civic engagement, and participation in public behaviors.

Results

A total of 172 respondents were surveyed over 18 different events. The age range of all responses was 18–72. Differences in age ranges between different levels of frequency of volunteering were evident, with the least frequent volunteers having the lowest average age (Table 1). First-time volunteers' average age was 36 years, mid-level volunteers' average age was 42, and frequent volunteers average age was 46 years. There were an equal number of males and females participating. Volunteer ethnicity was primarily Caucasian (85%). Annual income level, primarily between $60,000 and $80,000, showed some differences associated with frequency of volunteering, with those having highest frequency of volunteering showing higher income levels. Education level showed the most marked difference between the frequencies of volunteering, with a high percentage of most frequent volunteers having had graduate-level degrees as compared with those having participated less frequently. These demographics, when compared by frequency of participation, indicate that older, graduate school educated volunteers make up a larger part of the most frequently participating volunteers.

Table 1. Demographic data by level of engagement.

Variables	Entry level (%)	Ownership level (%)	Empowerment (%)
Education level			
Grad degree	12	0	42
College grad	28	50	44
Some College	40	35	14
H. S. Diploma	20	15	0
Average age	36	42	46
Income			
Up to 40,000	54	64	60
40,000–80,000	16	16	24
80,000–120,000	26	14	8
120,000–160,000	4	6	8

The factor analysis revealed a significant relationship between three sets of questionnaire items: (1) three measures of environmental identity, (2) four measures of personal pro-environmental behavior, and (3) attitude questions about place attachment, usefulness of the stewardship work, and being part of community efforts (Table 2). The analysis was run using Varimax rotation Kaiser normalization, with five rotations; the three factors explained 54% of the variation. Cronbach's α reliability supported acceptance of the three new 'collapsed' variables; since the individual questions measured the same aspect of concern, they were each averaged to create new indexes/composite scores for three new variables: environmental identity, private pro-environmental behavior, and civic engagement.

Research Question 1: Do attitudes of environmental identity predict pro-environmental behaviors? Environmental identity was significantly correlated with private pro-environmental behavior (Pearson's $r = .274$, $p = .000$, $N = 165$). When three groups of frequency of participation and levels of environmental identity were analyzed using a Wilcoxin rank sum test, those participating more frequently (mid-level and above) had significantly higher levels of environmental identity ($W = 436$, $z = 1.69$, $p = .045$).

Table 2. Factor analysis run on variables (Weights of each variable in each factor are in parentheses, Cronbach's α also shown).

	Questionnaire items included	Weight	Cronbach's α
Environmental identity	Cares for environment	.784	.746
	Pays attention to environmental issues	.776	
	Identifies as environmentalist	.721	
Private pro-environmental behaviors	Plants Natives in yard	.894	.921
	Removes yard invasives	.936	
	Uses yard green products	.899	
	Uses parks in spare time	.827	
Civic engagement	Feels work helps solve environmental problems	.835	.619
	Likes being part community efforts	.750	
	Place Attachment	.579	

Research Question 2: Is there a spillover effect between volunteering in parks and volunteers' private environmental behaviors? A Kruskal–Wallis rank sum test comparing private behavior and frequency of volunteering was not significant (Kruskal–Wallis $\chi^2 = .878$, $p = .645$). A second test was performed on a different grouping of the frequency of participation in stewardship; a Wilcoxin sign rank test performed between private behavior and the frequency of participation (divided into two groups, participating 1–5 times per year and 6–10 times per year) in stewardship was significant ($W = 872$, $z = 1.91$, $p = .028$). This indicates that there may be a split among in the mid-range frequency group, with those who participate 3–5 times per year (low end) participating less in private pro-environmental behaviors than those who participate in stewardship 6–10 times per year. Those who participate in volunteer activities six or more times per year engage significantly more in private pro-environmental behaviors than those who participated for the first time or 1–5 times per year.

Are those more engaged in stewardship also more engaged in public pro-environmental behaviors? We had asked respondents if they advocated for parks within the context of their local government and if they were interested in becoming volunteer leaders. When a Wilcoxin rank sum test was run on three different frequency groups (level 1 was 1–2 times per year, level 2 was 3–10 times per year, and level 3 was more than 10 times per year) and public pro-environmental behavior, there were significant results for the highest frequency of participation and engagement in a public pro-environmental ($W = 410$, $z = 1.59$, $p = .05$).

Figure 1 shows results of the principal component analysis conducted on stewardship variables, and allows us to visualize the explanatory power of input

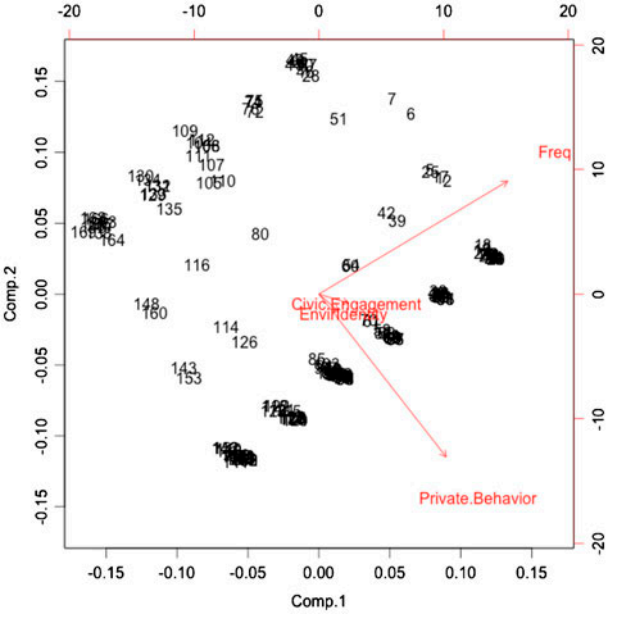

Figure 1. Biplot results for our principal component analysis, displaying two principal components, as well as the primary eigenvectors explaining this variance in our data. Each numbered data point represents a single survey responder.

variables. This graphic displays the strong explanatory power of the 'private behavior' vector and the frequency of participation vector. Most of the variation in our data was accounted for by the 'private behavior Axis' and the 'frequency of participation axis' which both increase in positive directions along the *x*-axis (component 1, 49.5% of overall variance) and in opposite directions along the *y*-axis (component 2, 37% of overall variance). The civic engagement vector and environmental identity vector both describe less of the variation in our overall data-set. Based on these results, we can also observe that frequency of participation has a positive relationship with all three of the other explanatory variables.

Research Question 3: Are those more engaged in stewardship also more engaged civically? Volunteers having level 3 volunteer frequency (10 or more times per year) had significant positive association with public pro-environmental behaviors (contacting elected officials to advocate for natural areas, $p = .0001$) and interest in becoming a volunteer leader ($p = .030$). Civic engagement itself was significantly associated with frequency of volunteering (Level 3 of participation, mean 4.4, level 2 mean 4.2, level 1 mean 4.1, Kruskall–Wallis test $H = 50.74$, $p \geq .001$). Those participating more than 10 times per year in stewardship, level 3, also participated in the greatest number of other environmental organizations (70 other organizations) as compared with level 2 (47 organizations). Participants at level 2 tended to participate in more socially oriented organizations (73) than level 3 (46). Volunteers at level 1 had the lowest rate of participation in other organizations (eight environmental, 10 other organizations).

Research Question 4: Do patterns of attitudes and behaviors differ significantly between three groups of volunteers based on frequency of volunteering? To sum up our findings reported above; environmental identity was significantly higher for level 2 and 3 of participation (Wilcoxin $W = 436$, $z = 1.69$, $p = .045$); private pro-environmental behaviors were significantly higher for levels 2 and 3 (Wilcoxin $W = 872$, $z = 1.91$, $p = .028$); civic engagement was significantly higher for level 3 of participation (Kruskall–Wallis $H = 50.74$, $p \geq .001$), and participation in public pro-environmental behavior was also significantly higher for level 3 of participation (Wilcoxin $W = 410$, $z = 1.59$, $p = .05$).

The three tiers of participation, levels 1, 2, and 3 appeared to us to correspond with the three levels of environmental literacy as defined by Hungerford and Volk (1990), and the model's corresponding attitude and behavior variables. We adapted the environmental literacy model, as described above, to see how it might help us understand differences in natural area volunteer attitudes and behavior. The three levels of environmental literacy are called entry, ownership, and empowerment. Entry level was equated with the level 1of participation in stewardship, from 1 to 2 times per year. Ownership level was equated with participation in level 2 of participation, from 3 to 10 times per year. Empowerment level was equated with level 3 of stewardship participation, from 11 to as many as 20 times per year. Trends in statistically significant differences in our main factors were grouped according to frequency of volunteering, as shown in Figure 2.

Differences between these three levels included (1) environmental identity, which was seen to be significantly higher for ownership level and above, (2) private pro-environmental behaviors, seen to be significantly higher for a mid-range of ownership level and above, (3) civic engagement, which was significantly higher for empowerment level of participation, and (4) public pro-environmental behavior, which was also significantly higher for empowerment level of participation. We

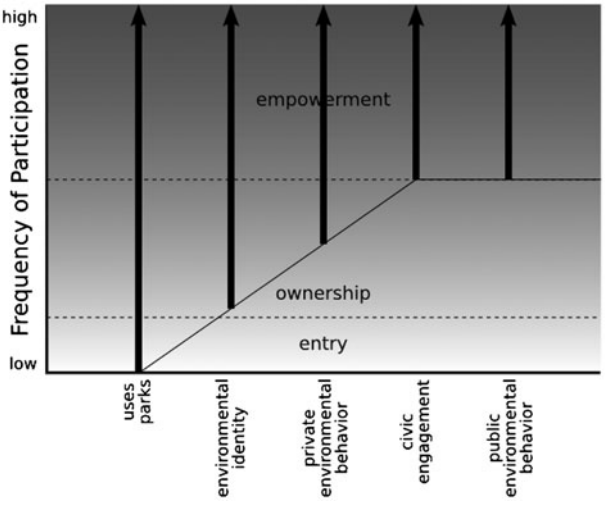

Figure 2. Characterization of each frequency of participation in stewardship with four constructs found to have statistical significance and one consistent throughout all levels.

examined responses that had a high rate of agreement for all participants, including those who were participating for the first time, to understand how those at an entry level of stewardship might fit into this environmental literacy pattern. The variable 'Uses parks in spare time' had approximately equal distribution among the three frequency groupings (entry level, mean 3.91, ownership level, mean 4.0, empowerment level, mean 3.90).

Figure 2 was developed to build a possible pattern of attitudes and behaviors that appears to follow the environmental literacy scheme. For example, entry or beginning level stewards may use parks frequently, but have not necessarily developed environmental identities or participate in other pro-environmental behaviors. Ownership or frequently participating stewards may use parks frequently, may have developed their environmental identities and participate in private pro-environmental behaviors, but do not participate in public pro-environmental behaviors nor do they exhibit civic engagement behaviors. Empowerment level or very frequent stewards may exhibit all of the measures attitudes and behaviors.

Finally, we asked questions focused on the volunteer's feelings about their own ability to bring about effective action directed toward restoration of the environment. In our study, the construct locus of control was based on only two questions. Although this construct is important to environmental identity, we do not have enough evidence based on only two questions to make any claims. At all levels of volunteer frequency, participants believed their work in restoration can influence the overall environmental quality; those at higher frequency of participation, (presumably due to having had more experience working with the organization) desired positions of greater responsibility and leadership (regression analysis $p = .021$) in their volunteer roles. These results indicate that volunteers who participated in our study view their work as valuable, which can be seen as an indication of having an internal locus of control.

Discussion

We found a positive association between the frequency of participation in stewardship and degree of environmental identity. In addition, environmental identity was significantly correlated with private pro-environmental behaviors. Stewardship opportunities appear to provide volunteers with opportunities to reinforce their existing environmental identities. Stewardship work may lead to further expression of those identities as volunteers engage in related pro-environmental behaviors. Particular aspects of environmental identity as expressed by participants in the open-ended responses on the questionnaires are included to provide depth to this construct. Below is an example of a pre-existing environmental identity:

> Grew up trying to save the planet and I enjoy this work, it's fulfilling, you can see the change over time. I feel good about my work.

One volunteer illustrated that a place-based identity can be reinforced through volunteering:

> (Volunteering) enabled me to have an intimate understanding of the city's natural areas and to be invested in what happens there.

We found a significant relationship between frequent volunteers and private pro-environmental behaviors. This relationship helped to explain a large portion of the variation in our data. Since stewardship work in parks typically occurs in a group setting, it is likely that social influence occurs. Social influence may link participation in volunteer activities with pro-environmental behaviors (Terry and Hogg 1996, 2000). Social influence operating via perceived norms is one driving force behind behavior change (Göckeritz et al. 2010; Nolan et al. 2008). Social influence might support behavior change, especially among more frequent volunteers, who often develop friendships. Informal discussions among participants, where participants might provide advice (normative influence) about their own landscaping practices (removing invasive plants, planting natives, not using chemical pesticides) may enhance a spillover of other behavior changes among volunteers. Comments made by one volunteer coordinator confirm her observation of a behavioral spillover effect from volunteering:

> I have gotten letters from volunteers saying 'thank you for teaching me about garlic mustard … and I have a huge field and had no idea it was full of invasives.' People took that message out into the world.

Taking environmental action on important issues including global climate change and loss of biological diversity is imperative. Understanding how to encourage environmental action taking on the part of volunteers would be a significant contribution to informal environmental education. In our study, volunteers who participated in stewardship frequently also participated in other active environmental behaviors such as contacting political representatives about environmental issues. We found a significant relationship between frequency of participation in volunteer stewardship, civic engagement, participation in public pro-environmental behavior, and participation in other organizations. This implies that stewardship in parks may be linked to overall civic responsibility and taking other environmental action. This claim is supported by Donald (1997), who found that individuals who are active members are more likely to actively participate in other environmental organizations than less-active members. Hibbard and Lurie (2006) similarly found that two-thirds of

volunteers working in Oregon on watershed enhancement projects were also active in other community organizations.

Volunteer participation in an organization may thus have a snowball effect, affecting overall participation in civic endeavors over time. More than half of our survey respondents indicated they talk to their neighbors about restoration. More than half (60%) of empowerment-level volunteers indicated interest in leadership positions. Similarly, participants in an Oregon Watershed Enhancement Board project were likely to encourage their neighbors to have restoration or other environmentally related projects carried out (Hibbard and Lurie 2006).

We think it is reasonable that greater civic engagement would be an outcome of participation in stewardship. Several statements made by participants indicated that from their perspectives this was one outcome:

> (Volunteering) makes me feel more positive about the world, feels like together we can make an impact on mitigating human impacts. I like restoration because of seeing a tangible impact.

> (Volunteering) broadens my ideas of what we need and the consequences of not doing it. We can make a small impact.

Portland's stewardship coordinators made their own observations regarding the relationship between civic engagement and stewardship, how stewardship fills community need, and how stewardship increases the empowerment of volunteers due to the experience of volunteering itself. These points correspond respectively with the following statements:

> I think that people already feel empowered to make change and make their own path. So if (a volunteer) wants to see change in this park, I have to be here making the change.

> (Volunteers are) keeping an eye on whether there is crime or graffiti. If you have worked hard to plant a grove of trees, you are going to say something if you see someone degrading the park.

> There are not many cities that you can go to and I feel like you can make change, personally through a small group of people. A huge benefit to us is we are creating stewards … who have ownership over something.

Stewardship activities in natural areas provide people living in a community with opportunities to interact with each other and create shared values and understandings, move beyond individual benefits and experience and work collectively in particular activities (trail building, invasive plant removal, and establishing native plants). Through participation, people may learn particular civic virtues, including trust and mutual respect, as well as practicing the democratic skills of discussion and organization. The outcomes of participation create ties that help bind society together (Edwards and Foley 1997). Volunteering by its very nature is participation in public life, with people participating in a shared endeavor which they perceive to be meaningful, and puts an emphasis on serving the common good, not just the self (Arai and Pedlar 2003).

Environmental volunteer work can be regarded as environmental action according to its definition within an environmental education democratic paradigm (Schnack 2008). Environmental volunteer work is an important aspect of environmental action taking. While we used the concept of pro-environmental behavior (a set of personal actions related to environmental improvement (Kollmuss and Agyeman 2002),

other approaches take a more critical approach towards action taking. Jensen and Schnack (1997) proposed providing for the participatory capability of citizens in a democratic society as an important aspect of adult environmental literacy. They propose an action competence approach instead of behavior change, where actions are intentionally targeted at solving environmental problems, either directly or indirectly, and individually or collectively. This approach involves conscious decision-making while considering how an action might change the status quo and power relationships, and takes cultural contexts into account to address environmental problems and possible solutions.

Participation in stewardship can be seen as an expression of environmental action. Along with stewards' involvement in other civic-minded organizations, taking environmental action indicates a degree of civic cooperation. These actions are linked to other collective environmental action, some of which have direct and indirect impacts on environmental quality. Volunteers working in stewardship thus present an appropriate audience in future studies of drivers of political environmental action and expressions of public environmental action and civic cooperation. Taking direct environmental action, by working through political parties to pass legislation on climate change, or changing the nature of our institutions to take their own environmental impact into account in decision-making, are all critical but were mostly outside the scope of this study.

The environmental literacy scale and our findings

Informal learning occurs through volunteering and regular engagement in natural areas. Although these activities are not typically thought to be educational, participation over time can generate new skills, knowledge, and attitudes. Some of what is learned includes the skills necessary to carry out a specific task. Mundel and Schugurensky (2008) found that the greater the complexity of the skill, greater the explicit knowledge gained by volunteers. Some of what is learned is social; people skills are an important area of learning for many volunteers. Often, this learning is not made explicit.

To date, environmental literacy has been applied to school-aged subjects (see e.g. Hsu and Roth 1998), but we are unaware of application for adults who are volunteering and participating in informal education settings until this study. Cognitive growth includes adults' ability to think in more complex ways and to consider a variety of perspectives. Moral development includes individuals developing an ethic of care for others. Psychosocial development includes the ability to support and nurture the succeeding generation. The frequency of participation, related to the intensity of the volunteers' experience, in volunteer activities has significant effects on learning (Astin and Sax 1998). The scope of the volunteer's experience represents the breadth of different opportunities present to a volunteer. For example, volunteer leaders are recruited to help train new volunteers in tasks.

Environmental service learning, such as stewardship of natural areas, is often used as a pedagogical strategy in environmental education (England and Marcinkowski 2007). This pedagogy was advocated by Donaldson and Donaldson (1958) calling for education 'in, about and for' the outdoors. Volunteers are in parks learning about the ecology working to change or improve (for) an ecological condition. Numerous studies point towards the centrality of stewardship or

environmental service learning in developing environmental literacy (Donald 1997; England and Marcinkowski 2007; Schneller 2008).

Entry-level environmental literacy includes empathy for nature and skills in maintenance of environmental quality. Ownership-level literacy includes behavioral components such as our volunteers' continued participation in stewardship. We assumed that volunteering a level 2, between 3 and 10 times per year was evidence of a personal investment in the activity, an ownership-level affective component. We used an adapted environmental literacy framework to understand our stewardship volunteer population. Our three levels of volunteering are folded into the three-tiered environmental literacy typology. We have shown that our results conform with those patterns expected for adult environmental literacy (Hollweg et al. 2011), specifically with particular attitudes and behaviors. We cannot assume that volunteers develop in their environmental literacy as a function of volunteer stewardship. Through participation in stewardship events, volunteers are learning about the local environment and consequently increasing their environmental literacy over time.

We were able to provide 'snapshots' of characteristics at each environmental literacy level; attitude and behavioral responses grouped by three factors explain 54% of variation. We considered whether volunteers might progress over time and advance through stages (e.g. entry level to ownership level). We saw patterns in our data, i.e. associations between attitudes and behavior and frequency of stewardship activity represented in Figure 2, suggestive of progress over time, but we cannot describe a progression through the three levels because we did not investigate volunteer behaviors and attitudes prior to volunteering.

To gain some insight about volunteer attitude and behavior change over time, we held focus groups with frequent volunteers a posteriori and asked them to describe their volunteering trajectory and their associated attitudes and behaviors. The participants indicated they had all started out with good intentions to make a big difference in the park, but soon 'plateaued out' as they realized their lack of skills combined with the enormity of the task was daunting. They explained that many other volunteers had quit at this point. However, these participants indicated that their love of being outdoors doing physical work kept them involved, along with a growing sense of social connection with the other volunteers. Over time, they explained, they perceived themselves with having gained the skills, and their awareness of the combined contribution of the other volunteers had, in some instances, made a visible difference in the park. Additionally, one participant explained that as he gained more knowledge about the ecological significance of the work they were doing, his feelings of satisfaction about his volunteer work increased.

In the 'Framework for Assessing Environmental Literacy', Hollweg et al. (2011) discuss feedback loops within the domain of environmental literacy; they point to ERB as the ultimate expression of environmental literacy. In our study, volunteer participation in environmental stewardship was our primary measure of behavior. We understood the relationship between behavior, knowledge, dispositions, and competencies as a continuum. In Hollweg's framework, knowledge includes understanding of physical and ecological systems, sociopolitical systems, environmental issues, action strategies, and solutions. We observed that volunteers learned about invasive ecology, plant identification and basic plant morphology. We thought it likely that volunteers might have understood some of the sociopolitical contexts of park management and an action strategy of stewardship that may contribute to a solution. The domain of dispositions includes taking personal responsibility, attitudes of concern

for the environment, motivation and intention to act, self-efficacy, and environmental sensitivity. We found relationships between the frequency of volunteering and volunteers' attitudes of connection to site, whether they paid attention to environmental issues or identified as someone for cares about the environment, all of which suggest sensitivity toward the environment. We found significant relationships between likelihood of volunteering again and participation in other behaviors. Feedback loops within the competencies can only be assumed within our study. We assume that by participating in volunteer stewardship, volunteers have evaluated, made some judgments about, and have some sort of plan to help resolve particular environmental issues by the nature of their choice to participate in these events. These assumptions have limitations; for example, some first-time volunteers indicated they attended these events mostly for social reasons or were brought by a friend.

Environmental literacy involves particular ways of acting on behalf of the environment. It also includes a critical thinking component. According to Orr (1994), the environmental crisis is a crisis of mind perception and values. Even well-educated people may continue to make choices, investments, and pass legislation that inadvertently continues to destroy habitats. Orr reminds us that the ecological crisis is about the failure to comprehend our citizenship in the biotic community, as Aldo Leopold noted in A Sand Country Almanac (1949). Orr points to an ecological aspect of citizenship, where conservation becomes an integral part of the daily life of ordinary people, and they use their skills and aptitudes to heal the earth and build good communities.

Future research

Further research might examine the degree to which established social norms operate and mediate behavior change. Among frequent volunteers, it appears that participation in stewardship is seen as socially desirable. Does the degree of social desirability vary among ages? Interested researchers could investigate attitudes such as 'How much do you think others in your neighborhood approve of stewardship activities?' as an example of social desirability. And, changes over time in stewardship attitudes and behaviors can be investigated to test some of our assumptions concerning causality. Lastly, further research might expand on our limited socio-demographic sample by sampling other types of volunteer events, such as volunteer work in public community gardens.

Strategies for volunteer coordinators

Volunteer coordinators may employ multiple strategies to maintain volunteers. Social interaction appears to be an important motivating force for beginning and continued involvement. Many members in the active group studied by Donald (1997) said they stayed with the organization because they had developed good friendships through participation. Volunteering in natural areas first helps participants develop attitudes of social belonging and learn more about the natural world. Nature education tied to stewardship work can serve as a continuing motivator. Making environmental impacts from volunteer work more visible is another factor that may increase volunteer interest. Volunteers who are made aware of the environmental benefits of their work at a site over time may be more motivated to continue to work at the site (King and Lynch 1998).

Conclusions

We found that adult stewardship volunteers in the Portland metropolitan area who participated in our study fell into one of three distinct groups based on their annual frequency of participation: first or second time (entry level) volunteers, those that volunteered 3–10 times per year (ownership level), and those that volunteered >10 times per year (empowerment level). On average, entry-level volunteers were younger than ownership-level volunteers, and empowerment volunteers had the highest average age (46 years). We also found that empowerment-level volunteers had higher rates of graduate degree attainment than the other two groups, and that both ownership- and empowerment-level volunteers earned higher annual incomes compared with those at the entry level.

Our statistical analysis revealed that the entry-, ownership-, and empowerment-level volunteers were also distinguishable based on their degree of environmental identity, pro-environmental behavior, and civic engagement. The most frequent volunteers indicated the highest degree of attention to environmental issues, planting native, and removing invasive species in their yards, using environmentally friendly products, and using parks in their spare time. Frequent volunteers were also more likely to feel personally attached to their local environment, to believe that their efforts help to solve environmental problems, and to enjoy being part of community efforts.

Participation in stewardship activities affords volunteers with opportunities to build social connections, to learn about their local environment, and to develop a sense of attachment to their own place. Further, our findings suggest that those who frequently volunteer in natural areas seek out additional ways to contribute to a broad range of other organizations and causes, which in turn may contribute to more resilient communities. These are benefits of participation that organizations that host stewardship events could leverage in order to recruit new and recurring volunteers.

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