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REVIEW ARTICLE

Motivations for volunteers to participate in ecological restoration: a systematic map

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Volunteering is a central means by which communities become engaged in ecological restoration projects and understanding what motivates volunteers is a core preoccupation of researchers because it may help recruit more people. This study addresses the question: what are the motivations and barriers to participation in ecological restoration projects? The systematic literature map method was used to answer this question. The results revealed a typology of motivations that consists of 15 categories. A co-occurrence network analysis of those categories revealed five core motivations that co-occur most in the literature: having a positive environmental impact, acquiring and sharing knowledge, caring for the environment, social interactions and community, and human health and well-being. Barriers to volunteering and the demographics of volunteers were also mapped in the literature, as they appeared frequently alongside motivations. The five core motivations represent a set of widely studied and well-understood motivations which can inform the design of volunteer programs. The literature indexed by the systematic map can form the basis of further systematic reviews and meta-analyses. This study highlights three major areas for future research: extrinsic motivations, demographics of volunteers who participate in ecological restoration, and project organization as a motivation.

Key words: literature review, network analysis, participation, systematic map, volunteer motivation

Implications for Practice

- Volunteer motivation can be understood to be either intrinsic or extrinsic and fit into four broad categories: environmental, personal growth, obligation, and enjoyment. Within that typology, 14 individual motivational categories are widely studied in the literature and can be used to inform volunteer program design.
- Research into volunteer motivation in ecological restoration can utilize the typology to frame and study specific motivating factors.
- Project organization is an important motivator for continued involvement, but falls outside of the motivational typology. Further research is needed to uncover the dynamics and role of project organization in volunteer engagement.

Introduction

Increased participation in ecological restoration by community members can generate interest in and acceptance of restoration, which is needed to increase the scale of restoration work and ensure positive outcomes (Perring et al. 2018). By understanding the motivations of participants, restoration practitioners can conduct restoration that engages the community. Opportunities to participate in restoration can involve communities in the planning and implementation of restoration, increasing engagement with the project and fulfilling one of the four principles proposed to guide the practice (Suding et al. 2015). While it is important to pay staff adequately and support restoration professionals, widespread volunteer participation in ecological restoration alongside paid professionals can offset costs (Daniels et al. 2014). There is a need to increase community engagement to support upscaling the practice of ecological restoration to confront the scope of biodiversity loss and meet the ambitious goal of the United Nations Decade on Ecosystem Restoration to create a "culture of restoration" (United Nations 2019).

Community engagement is important to restoration success, and including local communities in restoration projects can prevent projects from proceeding based on untested assumptions about the local community, a factor that can lead to the failure of restoration projects (Fox & Cundill 2018). While there have been some syntheses of biophysical restoration practices (Follstad Shah et al. 2007; Borkhataria et al. 2017; Shackelford et al. 2018), there has not yet been a synthesis of the multiple studies which investigate motivation to

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participate in ecological restoration despite calls to better understand the social dimensions of restoration (Wortley et al. 2013; Jones et al. 2018). Practitioners are encouraged to maximize engagement, and a map of the peer-reviewed knowledge on the motivations that lead people to participate in ecological restoration voluntarily can help achieve that goal.

Motivation is studied in the broader volunteering literature by analyzing the psychological functions served by volunteer activities (Clary & Snyder 1999; Einolf 2018). This approach is consistent with the psychological perspective on volunteering, which focuses on what moves individuals to participate (Hustinx et al. 2010). However, the sociological approach characterizes volunteering as a community activity, which demands examination of both inward and outward-facing motivations (Yeung 2004). Volunteering appeals to both intrinsic and extrinsic motivations—participants have some intrinsic motivation to contribute to a public good, but also seek something for themselves, often education or experience (Hustinx et al. 2010). This means that a person may volunteer both out of a desire to do good and for personal advancement. Barriers are often studied alongside motivations, as what prevents people from volunteering may be related to what enables it. While broad categories of motivation have been outlined in the Volunteer Functions Inventory (VFI), including values, understanding, enhancement, career, social, and protective (Clary & Snyder 1999), motivation is activity-specific. In the case of ecological restoration, motivations studied in the literature vary widely, which presents a challenge for practitioners looking to improve their work. In order for practitioners to make good use of the information, some synthesis is required (Field et al. 2014). This review addresses the following research questions: What are the motivations for volunteers to participate in ecological restoration and how are they interconnected? What are the barriers that prevent volunteers from participating in ecological restoration? What are the demographics (i.e. age, gender, ethnicity, and income) of volunteer populations studied in the literature?

Methods

The goal of a systematic map is to catalog a body of evidence, building a database of information about studies on a given subject (James et al. 2016). Evidence synthesis in environmental studies is frustrated by the heterogeneity of methods and measurements (Macura et al. 2019). A systematic map, in contrast to a systematic review, is capable of analyzing evidence that uses different methodologies, populations, and evaluations of outcomes (Levac et al. 2010). A systematic map can identify trends in the literature, knowledge clusters, and gaps, but it does not synthesize results. The output of a systematic map—the systematic map database—can provide both actionable insights and directions for future research, but does not synthesize findings as a systematic review would (James et al. 2016).

Literature Search

The following four databases were searched in February 2021: Web of Science, Scopus, Google Scholar, and ProQuest Dissertations and Theses Global. The search string was identical for three of the databases (Web of Science, Scopus, and ProQuest Dissertations) but modified for Google Scholar due to shorter length requirements.

Search terms were generated through a review of the literature and refined in consultation with an environmental research librarian at the University of Waterloo. The following search terms were applied to the title, abstract, and keyword search fields in each database:

> ("restoration ecology" OR "eco* restoration" OR "environment* restoration" OR "habitat restoration" OR "eco* remediation" OR "environment* remediation" OR "habitat remediation" OR "eco* reclamation" OR "environment* reclamation" OR "habitat reclamation" OR "eco* rehabilitation" OR "environment* rehabilitation" OR "habitat rehabilitation" OR "rewild*" OR "re-wild*" OR "reforest*" OR "re-forest*" OR "conservation") **AND** "motiv*" **AND** ("participation" OR "volunt*" OR "engagement" OR "citizen")

These searches yielded 2058 records after the removal of duplicates.

Screening

Screening criteria focused on studies that can answer the research question and eliminate extraneous studies, such as those that mention volunteering but do not study volunteers (Levac et al. 2010). Studies were included if they met the following criteria, which were selected to ensure that the research captured studied the motivations of volunteers:

(1) Peer-reviewed research or published dissertation.
(2) Primary data was gathered.
(3) English language.
(4) Study subjects are volunteers in active ecological restoration, conservation, or citizen science projects.
(5) Study specifically examined motivation of those volunteers.

The title and abstracts were manually screened, and 1643 of the 2058 records were excluded for not meeting the inclusion criteria. If there was uncertainty, studies were moved forward to full-text screening. For instance, if an abstract mentioned volunteers but not necessarily motivation, the study moved forward to the full-text screening. The inclusion criteria were applied in the full-text screening of the 415 records that made it through the first stage. During the full-text stage, 331 records were excluded. The most common reason for exclusion was that the studies did not focus on volunteer motivations, but simply included volunteers in the study. A total of 84 records moved forward to the final analysis (Supplement S1).

All screening and data extraction were completed using CADIMA, a software platform for systematic reviews and maps. The steps taken were documented according to the RepOrting standards for Systematic Evidence Syntheses in environmental research (ROSES) protocol—an approach to documenting

systematic reviews that is tailored to environmental research (Haddaway et al. 2018). This was chosen over Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), which is common in medical research, because ROSES supports multiple methods of analysis while PRISMA is tailored toward quantitative analysis (Moher et al. 2009; Haddaway et al. 2018).

Coding and Analysis

Two cycles of coding were applied to the 84 studies identified in the literature search. The first level used initial coding to identify the motivations, barriers, and demographics (Saldaña 2013). Initial coding is an open-ended approach to coding that was used to inform preliminary categorization of the motivations, barriers, and demographics in the studies. The second cycle employed axial coding, which groups codes around common themes, in order to group the motivations and barriers into categories (Charmaz 2006; Saldaña 2013). Axial coding involved grouping the initial codes around categories that emerged from the data itself. All coding was conducted by the lead researcher using Atlas.ti. Further interpretation was done using Gephi, R, and Microsoft Excel.

A network analysis was used to visualize the relationships between the second cycle motivation codes. Network analysis is a technique for visualizing the strength of relationships between items. In this case, it is employed to visualize the strength of relationships between the categories of motivations using a force-directed algorithm. Nodes represent categories and those that co-occur more frequently have edges with greater resistance, pulling the nodes closer together. Force-directed analysis was applied to re-orient the nodes using the Fruchterman–Reingold algorithm (Fruchterman & Reingold 1991). This analysis causes the edges to mimic springs, pulling more strongly related nodes together and pushing weaker relations to the outside.

Results

The records contained studies that were quantitative ($n = 39$), qualitative ($n = 20$), and mixed methods ($n = 25$). The most common lead author affiliation was United States ($n = 31$), followed by United Kingdom ($n = 13$), Australia ($n = 11$), and Canada ($n = 7$). Other countries included the Netherlands ($n = 3$), South Africa ($n = 3$), Spain ($n = 3$), Austria ($n = 2$), Japan ($n = 2$), Chile, China, Finland, Germany, Indonesia, Italy, Macedonia, Malaysia, and Thailand (all $n = 1$).

The studies commonly used surveys ($n = 61$) and interviews ($n = 42$) (or both [$n = 22$]) to study volunteer motivation. Less commonly used were focus groups ($n = 12$) and participant observation ($n = 11$). Just one study used document analysis. About one-third of studies used multiple tools to gather data ($n = 30$), though the majority relied on just one data collection tool.

Motivations

The most common motivation in the literature was captured by the code group "having a positive environmental impact" ($n = 61$) (Table 1). This code group was applied to papers that referred to volunteers being motivated by having a visible impact, such as making a contribution to conservation or science, or physically altering the environment. This code group applied when volunteers were motivated by the outcome of their work rather than describing a feeling. For example, volunteers cutting invasive tree mallow (*Malva arborea*) in Scotland reported satisfaction from the act of removing plants (Pages et al. 2018). In comparison, the motivation group "care for the environment" was used when papers referred to pro-environmental values in the motivation of volunteers, but not necessarily the outcome of their actions ($n = 58$). Motivations in this category often took the form of personal values or community norms. For instance, volunteers in Japan who felt caring for greenspace was the responsibility of the community were more likely to volunteer (Sakurai et al. 2015). While the two categories are clearly related, "having a positive environmental impact" emphasizes the motivational potential of an immediate visible impact, such as that provided by engaging in ecological work, while "caring for the environment" is more diffuse.

Acquiring and sharing knowledge was used when volunteers reported being motivated both by gaining knowledge and by teaching others ($n = 58$). These motivations ranged from a general desire for knowledge to a desire to learn about a specific species or ecosystem. For instance, participants in a digital community science platform tracking bumblebees were motivated by improving their bumblebee identification skills (Sharma et al. 2019).

The group "social interactions and community" was applied to studies where volunteers reported being motivated by social interactions, by being a part of a group and engaging with the community ($n = 52$). For example, volunteers who wanted to build community were more likely to be committed to a conservation project (Asah & Blahna 2013). The code group "personal health and well-being" was used when volunteers reported being driven by their own physical fitness, general positive motivations, and personal growth ($n = 41$). For example, volunteers with the Minnesota Master Naturalist program reported stress reduction, relaxation, and exercise as motivators for getting involved (Guiney 2009).

In many studies, spending time in nature was reported as a motivation in and of itself, as volunteers saw the activity as a reason to be outdoors ($n = 37$). A smaller set of papers reported career-centric motivations from volunteers ($n = 25$). This code group was applied when volunteers discussed enhancing or gaining skills relevant to their careers or making a career change. Place-related motivations ($n = 22$) include a pre-existing connection to the place where restoration and conservation are occurring. Recreation and access to special places were used when volunteers enjoyed the activity as a recreational hobby (e.g. birders who participate in bird surveys) ($n = 20$). Studies that included recreation as a motivation also mentioned the opportunity to access special places that was afforded by participation in the volunteer activity. Some volunteers were motivated by perks and recognition received as part of volunteering ($n = 17$). The code group "specific species or organism" was

Table 1. A list of 15 motivations studied in the literature.

Code group name	*Description*	*No. of studies*	*Examples*
Having a positive environmental impact	Volunteers are motivated by contributing to conservation and science, having a visible impact on the environment and feelings about their need to give back to nature.	61 (72.6%)	Akin et al. (2013); Caissie and Halpenny (2003); Asah et al. (2013)
Acquiring and sharing knowledge	Volunteers are motivated by learning about the natural world broadly, gaining specific skills and knowledge, and teaching others.	58 (69%)	Sharma et al. (2019); Currie et al. (2016); Krasny et al. (2014)
Care for the environment	Volunteers are motivated by pro-environmental values that they already hold, as well as social norms in the form of traditions or cultural practices.	58 (69%)	Larson et al. (2020); Sakurai et al. (2015); Dunkley (2019)
Social interactions and community	Volunteers are motivated by social interactions, being part of a group and engaging with a community.	52 (61.9%)	Currie et al. (2016); Asah and Blahna (2013); Toomey et al. (2020)
Health and well-being	Volunteers are motivated by the chance to improve their physical fitness, positive emotions from volunteering and personal growth.	41 (48.8%)	Guiney (2009); Asah and Blahna (2013); DiEnno (2009)
Time in nature	Volunteers are motivated by the opportunity to spend time in nature, enhance their connection to the natural world and escape the demands of everyday life.	37 (44%)	Douglas and Rollins (2007); Guiney (2009); Van Den Berg et al. (2009)
Career	Volunteers are motivated by enhancing their current careers or gaining skills and experience to switch careers.	25 (29.8%)	Bruyere and Rappe (2007); Dunkley (2019); Pages et al. (2018)
Perceived need for action	Volunteers are motivated by being asked to volunteer, perceived threats to the environment and the desire to protect valued natural features.	25 (29.8%)	Lin et al. (2020); DiEnno and Thompson (2013); Hennessey and Beazley (2014)
Place-related	Volunteers are motivated by a pre-existing connection to place and can develop a sense of attachment that serves as further motivation for volunteering.	22 (26.2%)	Currie et al. (2016); Measham and Barnett (2008); Mumaw (2017)
Recreation and access to special places	Volunteers are motivated by experiences that align with recreational hobbies like birding, provide new opportunities for recreation and facilitate access to special places.	20 (23.8%)	DiEnno and Thompson (2013); Thomas et al. (2021); Wright et al. (2015)
Perks and recognition	Volunteers are motivated by perks like access to special places, recognition from the community and staff, and other non-monetary benefits they receive from volunteering.	17 (20.2%)	Caissie and Halpenny (2003); Guiney (2009); Khatimah et al. (2019)
Specific species or organism	Volunteers are motivated by caring for a particular species or organism, sometimes as a result of cultural or personal significance.	16 (19%)	Pages et al. (2018); Sharma et al. (2019); Toomey et al. (2020)
Activity-specific	Volunteers are motivated by activities that provide immediate gratification, are hands-on and affect organisms or ecosystems they care about.	15 (17.9%)	Pages et al. (2018); Thomas et al. (2021); Weston et al. (2003)
Future generations	Volunteers are motivated by the idea of caring for future generations who will inhabit this Earth.	11 (13.1%)	Asah et al. (2014); Ding and Schuett (2020); Ganzevoort and van den Born (2020)
Project organization	Volunteers are motivated by projects that are well-organized and use their time effectively.	8 (9.5%)	Bruyere and Rappe (2007); Ding and Schuett (2020); He et al. (2019)

applied to studies where volunteers were motivated by care for a particular species or organism ($n = 16$). In some cases, this species was of particular cultural or personal significance. The activity-specific motivation code group ($n = 15$) included codes applied when volunteers reported being motivated by the activity itself, such as those that provided immediate gratification. The code group "future generations" was applied when volunteers reported being motivated by care for children or the world they will inherit. Finally, the project organization motivation code group was applied when volunteers reported that the project being well-organized was a factor in their participation ($n = 8$). The categories were further grouped into intrinsic and extrinsic motivations, and related to the environment, personal growth, obligation and enjoyment (Table 2).

The co-occurrence matrix shows the number of papers in which two categories occurred together (Table 3). This allows

Table 2. A typology of environmental volunteer motivations.

	Intrinsic	*Extrinsic*
Environmental	Time in nature	Having a positive environmental impact
	Care for the environment	Place-related
	Specific species or organism	
Personal growth	Acquiring and sharing knowledge	Career
	Health and well-being	Social interactions and community
Obligation	Future generations	Perceived need for action
Enjoyment	Activity-specific	Recreation and access to special places
		Perks and recognition

for further analysis that investigates which motivations tend to appear alongside one another in the research.

Visual analysis was used to further analyze the co-occurrence table. We modeled the co-occurrence of motivations using a Fruchterman–Reingold rotation (Fig. 1), which clusters factors that tend to co-occur more frequently by modeling the relationship between them based on the number of co-occurrences. Motivations that co-occur more frequently have a higher stiffness value, meaning they will be closer together when the modeled force is applied. Nodes that are closer together have a higher number of co-occurrences, as reflected in Table 3. The visual analysis revealed five motivational categories with a high degree of co-occurrence between one another: having a positive environmental impact, care for the environment, acquiring and sharing knowledge, health and well-being, and social interactions and community. These motivations are frequently studied together and so form a core group of commonly studied motivations, while the remaining 10 motivational categories are less frequently studied together.

Barriers to Volunteering

The barriers to volunteering were reported in some, but not all, papers that were part of this review (Table 4). The main barrier to participation reported in the research was a lack of time and energy ($n = 19$). This code group was applied when volunteers or potential volunteers reported time conflicts that interfered with their volunteering. In some papers, volunteers cited the difficult nature of restoration work as a barrier ($n = 15$). Some studies found that a lack of awareness of opportunities was a barrier to volunteering ($n = 11$). Remote sites or those that were outside of urban areas could present a transportation barrier ($n = 7$). Poor communication between managers and volunteers was identified as a barrier ($n = 6$). Potential volunteers reported feeling excluded from projects because of factors like a lack of education or their gender ($n = 5$).

Demographics of Study Populations

The demographics reported in studies included age ($n = 53$), gender ($n = 52$), economic status ($n = 42$), race ($n = 18$), whether the participant was from an urban or rural area ($n = 5$), nationality ($n = 2$), how long participants lived in a place ($n = 2$), and political alignment ($n = 2$) (Table 5).

Systematic Map Database

The systematic map search and screening process resulted in a list of 84 journal articles that discuss the motivation for volunteers to participate in ecological restoration and conservation. That list has been included in Supplement S1.

Discussion

This research mapped the literature on volunteer motivation to answer the following questions: What are the motivations for volunteers to participate in ecological restoration, and how are they interconnected? What are the barriers that prevent volunteers from participating in ecological restoration? What are the demographics (i.e. age, gender, ethnicity, and income) of volunteer populations studied in the literature? We found that the literature focuses on five core motivations that are both commonly studied and highly interrelated: having a positive environmental impact; acquiring and sharing knowledge; care for the environment; social interactions and community; and health and well-being. There were 10 motivations that were less commonly studied and less interrelated. Six barriers emerged from the map: lack of time and energy, difficult and costly work, unaware of volunteer opportunity, difficulty reaching the site, poor management, and implicit or explicit exclusion. The demographics categories that tended to be reported were age, gender, economic status, race, urban or rural, nationality, duration lived in a place, and political alignment.

A Typology of Motivation

The 15 motivations documented by this systematic map form a typology of volunteer motivation for ecological restoration and conservation. The typology contains motivations in four broad groups: environmental, personal growth, obligation, and enjoyment. Environmental motivations include place-based motivations, spending time in nature, having a positive environmental impact, caring for the environment, and attachment to a species or organism. These motivations are connected to the environmental nature of the work of restoration and conservation volunteering, while personal growth motivations may be satisfied by non-environmental volunteering. That distinction can be further broken down into intrinsic (i.e. the volunteer is rewarded by internal feelings) and extrinsic (i.e. the volunteer is rewarded by the external world) motivations (Bénabou & Tirole 2003).

Table 3. Co-occurrence of motivations matrix.

	Acquiring and sharing knowledge	Activity-specific	Career	Future generations	Having a positive environmental impact	Health and wellbeing	Perceived need for action	Perks and recognition	Place-related	Project organization	Recreation and access to special places	Social interactions and community	Specific species or organism	Time in nature	Care for the environment
Acquiring and sharing knowledge	X	11	18	10	47	30	16	12	16	5	16	39	11	27	40
Activity-specific	11	X	6	2	14	10	5	4	5	3	4	12	4	8	13
Career	18	6	X	3	19	15	10	7	8	6	10	20	4	14	21
Future generations	10	2	3	X	7	7	4	2	5	1	3	9	2	4	8
Having a positive environmental impact	47	14	19	7	X	35	19	13	18	7	19	41	10	33	45
Health and wellbeing	30	10	15	7	35	X	16	13	16	6	12	31	5	22	33
Perceived need for action	16	5	10	4	19	16	X	7	12	3	9	19	6	11	21
Perks and recognition	12	4	7	2	13	13	7	X	3	4	8	11	1	7	14
Place-related	16	5	8	5	18	16	12	3	X	4	5	18	5	10	19
Project organization	5	3	6	1	7	6	3	4	4	X	3	7	0	3	8
Recreation and access to special places	16	4	10	3	19	12	9	8	5	3	X	16	3	13	15
Social interactions and community	39	12	20	9	41	31	19	11	18	7	16	X	9	31	39
Specific species or organism	11	4	4	2	10	5	6	1	5	0	3	9	X	6	9
Time in nature	27	8	14	4	33	22	11	7	10	3	13	31	6	X	24
Care for the environment	40	13	21	8	45	33	21	14	19	8	15	39	9	24	X

Typologies such as the one proposed in this paper can be valuable analytical tools in the social sciences which can enable conceptual creativity and analytical rigor (Collier et al. 2012). Two-dimensional typologies provide eight unique combinations (e.g. Intrinsic-Environmental) that can be further explored using the individual motivations (e.g. time in nature). While the intrinsic–extrinsic dichotomy has been criticized for being too simplistic, the addition of the categories of environmental, personal growth, obligation, and enjoyment motivations creates a matrix which deepens the description (Reiss 2012).

Many of the motivations revealed by this map are served directly by the activities typically involved in ecological restoration. For example, removing invasive species has a visible positive environmental impact, can be an outlet for care for the environment, involves acquiring and sharing knowledge and is physical work that contributes to health and well-being (Pages et al. 2018). Some, particularly those that are described as extrinsic motivation, require facilitation to implement. For instance, program managers must decide to offer access to special places for volunteers.

Five motivations form a set for which there is abundant evidence in the literature: having a positive environmental impact, care for the environment, health and well-being, acquiring and sharing knowledge, and social interactions and community. The interconnectedness of all motivations was analyzed by constructing a co-occurrence matrix and conducting network analysis on the code categories. Co-occurrence means that these motivations are often studied together, which may signal that they are connected in some way, or can be served by one activity.

Barriers to Volunteering

A set of barriers was also uncovered that includes six categories of barriers: difficult and costly work; unaware of volunteer

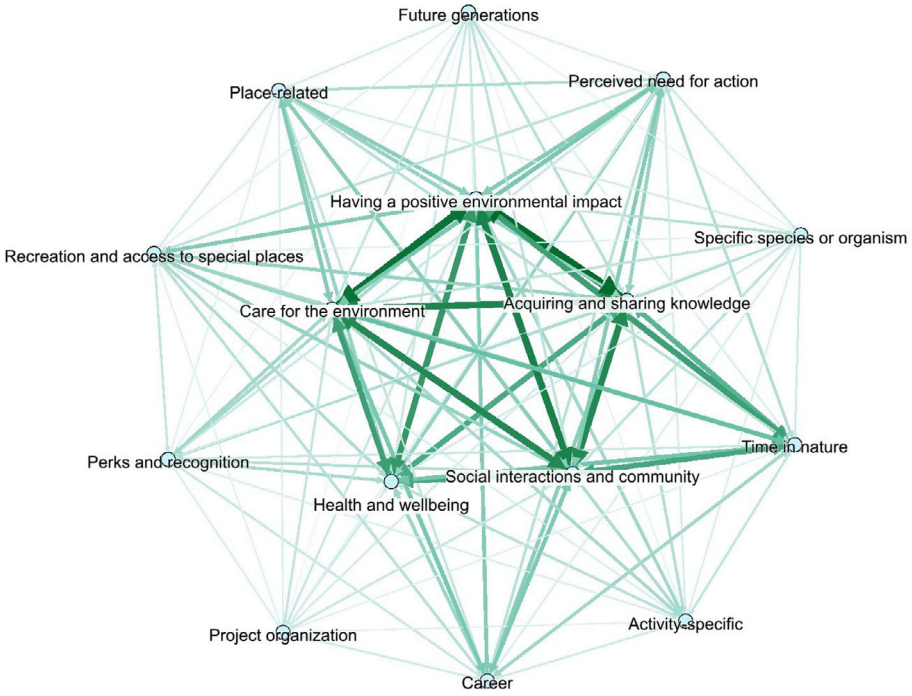

Figure 1. Co-occurrence of motivations diagram. This diagram uses a Fruchterman–Reingold rotation to show the relationship between motivational categories. The nodes represent the categories and have a repulsive force and edges are modeled as springs, with their resistance calculated based on the number of co-occurrences. The equation for Hooke's law, $F = kx$, is used to determine stiffness, where F equals the force required, k is equal to the number of occurrences, and x is the distance the spring is deformed. Categories that co-occur less frequently have a lower stiffness measurement and thus are pushed further apart.

Table 4. Barriers to volunteering studied in the literature.

Code group name	*Description*	*No. of studies*	*Examples*
Lack of time and energy	Personal and work conflicts around time were one reason for not volunteering.	19 (22.6%)	Hunter (2010); Kaeser et al. (2018); Merenlender et al. (2016)
Difficult and costly work	The work of ecological restoration can be physically difficult.	15 (17.9%)	Richter et al. (2018); Miller (2020); O'Brien et al. (2010)
Unaware of volunteer opportunity	Potential volunteers reported not being aware that they could volunteer for a particular project.	11 (13.1%)	Hobbs (2012); Pages et al. 2018; O'Brien et al. (2010)
Difficulty reaching site	Remote or difficult to reach sites presented a barrier.	7 (8.3%)	Rinkus et al. (2017); Miller (2020); DiEnno (2009)
Poor management	Communications problems between management and volunteers.	6 (7.1%)	Miller (2020); Hennessey and Beazley (2014); Higgins and Shackleton (2015)
Implicit or explicit exclusion	Potential volunteers reported being left out of communications or feeling excluded.	5 (6%)	Méndez-López et al. (2015); Hobbs (2012); Rinkus et al. (2017)

opportunity; difficulty reaching site; poor management; implicit or explicit exclusion. Barriers are things that prevent people from volunteering, and as such can be difficult to study since those who experience the greatest barriers are unlikely to volunteer. Barriers are often case specific and may be imposed by project leaders—for example, a study of local populations in six communities in southern Mexico reported that some people felt excluded because of a lack of education and some sectors were deliberately excluded from participation by project managers (Méndez-López et al. 2015).

Three of the reported barriers—lack of time and energy, difficult and costly work, and difficulty reaching site—are likely to be present in restoration and conservation projects regardless of the quality of management. The work is often physical and may require an investment of tools or time, and sites may be distant from urban centers. The broader volunteer engagement literature revealed three common barriers based on data from a national survey: lack of time, lack of interest, and ill health (Sundeen et al. 2007). While this systematic map did not uncover ill health as a barrier, it is clear that someone's personal

Table 5. Demographics studied in the literature.

Code group name	*Description*	*No. of studies*	*Examples*
Age	The age of participants was reported.	53 (63.1%)	MacPhail et al. (2020); Athihirunwong et al. (2018); Douglas and Rollins (2007)
Gender	The gender of participants was reported.	52 (61.9%)	Domroese and Johnson (2016); Ganzevoort and van den Born (2020); Lucrezi et al. (2018)
Economic status	The economic status (e.g. income or employment status) was reported.	42 (50%)	Maund et al. (2020); Wright et al. (2015); Sharma et al. (2019)
Race	The race of participants was reported.	18 (21.4%)	Jones et al. (2021); Larson et al. (2020); Van Den Berg et al. (2009)
Urban or rural	Whether the participants were from urban or rural areas was reported.	5 (6%)	Sarvilinna et al. (2018); Broun et al. (2009); Hvenegaard and Perkins (2019)
Nationality	The nationality of participants was reported.	2 (2.4%)	Atchison et al. (2017); Lucrezi et al. (2018)
Place duration	How long participants lived in a place was reported.	2 (2.4%)	Sakurai et al. (2015); Hennessy and Beazley (2014)
Politics	The political alignment of participants was reported.	2 (2.4%)	Weston et al. (2003); Larson et al. (2020)

health and capabilities would have some bearing on whether the work and difficulty reaching the site are major barriers to participation. One approach to studying barriers captured by our systematic map interviewed people who participated in naturalist training programs but did not progress to volunteering. Interviewees said the primary barrier was lack of time (Merenlender et al. 2016). Future research into barriers may require novel methods to survey or interview people who have not volunteered.

Demographics of Volunteers

There were eight demographic categories commonly studied: age, economic status, gender, nationality, politics, race, urban, or rural. About 71.4% ($n = 64$) of the papers included discussed demographics in some way. Where the race of volunteers was surveyed and reported on, volunteers tended to be mainly White (e.g. Van Den Berg et al. 2009; Larson et al. 2020; Jones et al. 2021). One paper surveyed 3041 citizen science volunteers across the United States and found that 97% identified as White (Larson et al. 2020). Gender was among the more frequently reported categories of demographics, and it may be possible to do a meta-analysis of the gender of volunteers in a future study. There were papers where the majority of volunteers were women (Markus & Blackshaw 1998; Domroese & Johnson 2016; Martin & Greig 2019) and ones where the majority of volunteers were men (McSkimming & Berg 2008; Lucrezi et al. 2018; Ganzevoort & van den Born 2020). While some papers reported higher incomes among their volunteers earners (Wright et al. 2015; Domroese & Johnson 2016; Maund et al. 2020), others reported a wide spread of incomes (Guiney 2009; Niemiec et al. 2018; Sharma et al. 2019), or even lower incomes (Rinkus et al. 2017) than the general population. These findings suggest a future direction for research which could examine the demographics of volunteers and barriers preventing unrepresented populations from participating in volunteer ecological restoration activities.

Directions for Future Research

While the systematic map can provide an overview of the findings in terms of motivation, it should not be taken as a commentary on which motivations are most significant. Volunteers almost never have a singular motivation, but rather are acting on multiple motivations simultaneously (Athihirunwong et al. 2018; Ganzevoort & van den Born 2020; Jones et al. 2021). A systematic map is not designed to provide such a synthesis, but instead to catalog the available evidence and point the way for future research (James et al. 2016).

The findings of this systematic map also matched up with the VFI, which postulates that motivations to volunteer serve six psychological functions: values, understanding, social, career, protective, and enhancement (Clary & Snyder 1999). A meta-analysis of studies that use the VFI may yield a clearer picture of the prevalence of motivations among environmental volunteers.

One motivation did not fit into the typology: project organization. Project organization is important because it has been identified as a key component of volunteer commitment to projects (Ryan et al. 2001). Volunteers who experience this motivation report that they like to be part of a program that uses their time well (Bruyere & Rappe 2007). Established projects that have experienced leadership and well-developed goals can serve this motivation (Ding & Schuett 2020). Contrary to this background and our expectations, project organization only appeared in eight studies, despite being highlighted as a key component for volunteer commitment. The lack of representation of studies that look at project organization as a motivation suggests that future research into volunteer motivation in ecological restoration should closely consider project organization. While some papers surfaced a general understanding of project organization, there is an opportunity to explore, in detail, how project organization is connected to volunteer engagement.

Conclusion

Motivation is a key area of knowledge to enable the upscaling of ecological restoration through participation. A deeper

understanding of the motivations that drive volunteers can help practitioners understand how to attract and retain volunteers for ecological restoration projects. This systematic map documented a typology of 15 motivations for participating in ecological restoration and highlighted five among those that co-occur most frequently. This typology provides an answer to the question of what motivates volunteers to participate in ecological restoration projects. By embracing the typology when developing, marketing and executing volunteer ecological restoration projects, practitioners can enhance the engagement of volunteers in those projects.

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Supporting Information

The following information may be found in the online version of this article:

Supplement S1. List of 84 papers included in systematic map.

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