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Research

What makes a convivial community tool? Investigating grassroots ecological restoration

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ABSTRACT. The practice of ecological restoration through native plant gardening is emerging among community groups as a means of addressing degradation in urban landscapes. Despite this trend, restoration remains primarily studied as a professional practice. Grassroots associations support people in growing native plants, but within the research on restoration ecology, there remains little study of how non-professionals engage in the practice. We adapt and expand Ivan Illich's concept of a convivial community tool (i.e., a tool that is open and accessible rather than restricted to certain users) to ecological restoration through a case study of the Ottawa Wildflower Seed Library. Participants highlighted two main strategies of the seed library: overcoming barriers and supporting emergent practices. The seed library helped people overcome the barriers of plant availability, cost, and knowledge, while supporting spontaneous initiatives from volunteers to further the mission of the seed library. We argue that these two strategies operationalize the idea of a convivial community tool. This research contributes an understanding of one way that ecological restoration can broaden its appeal by empowering non-professionals to engage in restoration and provides a starting point for a novel organizational framework based on Illich's ideas.

Key Words: *convivialism; restoration ecology; community; volunteer engagement*

INTRODUCTION

Ecological restoration has the potential to help address global biodiversity collapse and create nature-based solutions to climate change, offering communities tangible actions to take in the face of global degradation (Murphy 2018). Much research has been conducted into the professional practices of ecological restoration: principles and standards are debated; practitioners have been surveyed; researchers regularly probe the knowledge-practice divide (Clewell and Aronson 2013, Dickens and Suding 2013, Nelson et al. 2017). Although a great deal of ecological restoration is undertaken by communities, neighborhood groups, and private citizens (Cruz et al. 2014, Watkins et al. 2015, Haigh 2016), there is little understanding of how non-professionals engage in the practice. Research that focuses on community members tends to examine volunteers who are part of larger initiatives orchestrated by professional organizations (Asah et al. 2014, Ding and Schuett 2020). There is a need to better understand the grassroots practice of ecological restoration to meet the ambitious goals of the UN Decade on Ecosystem Restoration (United Nations 2019).

The idea of a "convivial community tool" describes tools, knowledges, and practices that are open and accessible as a counterweight to professionalization and the restriction of access through industrial capitalism (Illich 1973, Bradley 2018, Kozubaev and DiSalvo 2020). For instance, bike kitchens are communal bicycle repair workshops that allow anyone to access bicycle repair tools and knowledge (Bradley 2018). If native plant gardening is considered a tool, can it be made into a "convivial community tool" and what would be required to do so? Although there are practical examples of community tools and principles on designing technology with that framework, there is a gap in operationalizing the concept (Mancini and Mancini 2015, Vetter 2018, Voinea 2018). Illich provided the philosophical underpinnings of the idea rather than a prescriptive guide on how to create such a tool (Illich 1973). Before it is possible to develop a blueprint, it is important to examine the phenomenon as it occurs naturally. Conviviality is not only a quality of the tool itself, but also something that must be practiced by spaces or organizations that govern access (Mehra and Rioux 2016). This paper investigates the practices that a grassroots association uses to support ecological restoration as a convivial community tool.

Such community-led efforts can contribute to the creation of a "restorative culture" and enable holistic restoration that underscores the connection between people and the ecosystems they inhabit (Cross et al. 2019). Typical urban properties are degraded: there is little native biodiversity, poor linkages between patches of quality habitat, and a lack of habitat features on the landscape (Hobbs 2016). Small gardens can support significant populations and provide habitat (Soanes et al. 2019). Conventional gardening practices usually involve planting with non-native species and prioritizing turfgrass. Individual property owners make planting decisions that cumulatively degrade ecosystems further, creating a "tyranny of small decisions" (Thompson 2004). Shifting people toward pro-environmental behaviors like native plant gardening requires more than motivation; barriers to the desired behavior must be lowered or eliminated (McKenzie-Mohr and Schultz 2014). Barriers to the practice of native plant gardening include availability of native plants, specialized knowledge, and community support (Beckwith et al. 2022). Creative approaches to restoration, including incorporating rituals and art, have been positioned as a complementary alternative to scientific, technocratic restoration (Cabin 2007, Curtis 2009, Ahn 2016). In order for the practice to remain flexible and creative, it is important to study initiatives that exist outside of the professional strictures of restoration and to maintain an open definition of the practice (Light 2000, Higgs et al. 2018). Such an approach, embodied in native plant gardening, provides a pathway toward an ethic of caring for the land, but despite its virtues, the practice is not yet widespread

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(Mumaw and Mata 2022, Segar et al. 2022). We believe that an understanding of how organizations can enable participation in ecological restoration will contribute to making it more widespread.

We conducted a qualitative case study of the Ottawa Wildflower Seed Library (OWSL) to understand if (and how) a grassroots ecological restoration organization empowers people to engage in the practice, and specifically if (and how) that organization operates as a convivial community tool.

METHODS

The OWSL is a community project started by Mélanie Ouellette in 2020. It was selected for this research because it combines restoration with a library approach, which has been called a prototypical community tool (Mehra and Rioux 2016). As a nascent organization, it most resembles a grassroots association because it consists of entirely unpaid volunteers (Smith 2000). The seed library provided seeds to more than 1300 people in 2022–2023. Participants in the seed library communicate with each other through a private Facebook group, where they regularly exchange knowledge and coordinate events. The private Facebook group had 6058 members as of 31 May 2024.

We examined the practices of the seed library using data collected through one-on-one semi-structured interviews with participants who contributed to the work of the seed library (Appendix 1). Two rounds of interviews were conducted to capture a broad range of the seed library's practices, including plant swaps that happen in the spring and seed giveaways that happen in the fall. Interview subjects were recruited through the OWSL Facebook group using several postings at different times. Posts were made with the permission of the group administrator on weekday mornings and afternoons and weekend days for maximum visibility. Participants were eligible for an interview if they had any involvement with the seed library, including relatively minor participation (such as engaging in the Facebook group) or more extensive participation (such as hosting seed giveaways). Oral consent was recorded for each participant. A modified consent script was used for Ouellette, who indicated her consent for being named in this research. Participants were asked to email the lead author, and interviews were scheduled to take place using Zoom. This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Board (REB 44185).

The interview schedule was developed through a review of the literature on convivial community tools (Illich 1973, Vetter 2018, Voinea 2018). Interview questions were piloted with three subjects who have hands-on experience running grassroots associations and familiarity with the idea of a convivial community tool. The interview schedule contained a series of 17 questions (Appendix 1) that asked about each of the tasks the subject participated in. This approach allowed for a thorough exploration of the dynamics of each practice the seed library employs. This research takes place at the mesoscale, focusing on aspects of how a grassroot association is organized, with results that may be transferrable to other associations (Smith et al. 2016). This scale is between the individual scale (e.g., a study of leadership) and the macro scale (e.g., a study of many organizations).

The resulting interviews were transcribed by TA using Zoom's automated transcription feature and manually verifying each transcript with the recording. The transcripts were coded by using Atlas.ti 9. Initial codes were a combination of *in vivo* and created codes (Saldaña 2013). The initial coding phase was followed by axial coding, where the initial codes were grouped together to identify common themes present in the data.

Member-checking is a process of bringing ideas back to participants, allowing them to verify the interpretation and add details where merited (Charmaz 2006). A synopsis of the findings of this research was shared with all interview participants in 2023, to bolster the reliability of this study by verifying findings with participants who contributed to them (Birt et al. 2016). No participants offered additional information or corrections.

The first round of interviews was conducted in May 2022 and included 18 participants. The second round of interviews was conducted in November 2022 and included 10 total interviews: 6 new participants as well as 4 returning participants (participants 1, 5, 13 and Ouellette). There were a total of 24 unique participants in these interviews, which lasted between 20 minutes and 2 hours. The age of participants ranged from 22 to 64 years, with an average age of 50.4 years. Many participants were first-time native plant gardeners who became involved with the seed library when they adopted the practice. The initial coding process yielded 988 codes, which were then grouped into 43 code groups through axial coding.

RESULTS

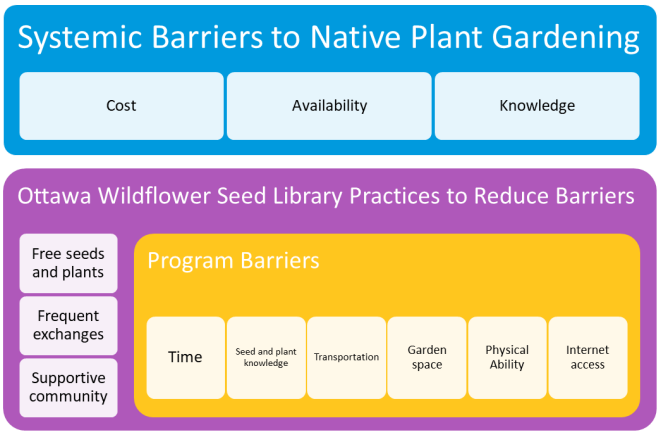
All participants were asked about accessibility and barriers to activities of the seed library, as well as barriers to native plant gardening that the seed library helped them overcome. Two categories of barriers emerged from the data: external systemic barriers to native plant gardening, and internal program barriers.

Systemic barriers identified by participants included the cost of native plants, the availability of those species of plants, and knowledge about how to grow and care for them.

Participants identified six main barriers present to varying degrees in seed library activities: time, seed and plant knowledge, transportation, garden space, physical ability, and internet access (Fig. 1). Each of the three systemic barriers was addressed by the strategy of the seed library as described by participants who engaged in the organization's practices.

The seed library uses two distinct pathways to help people overcome barriers: top-down program design and emergent practices (i.e., spontaneous initiative-taking by participants toward the mission of the seed library). Ouellette, as the leader and manager of the project, endeavors to keep activities accessible. For instance, she intentionally selects pick-up locations in parts of Ottawa accessible by transit and holds at least five seed pick-up events in order to ensure people can access the locations. Additionally, she mails seeds to those who may have difficulty coming to in-person events. The top-down program design of seed giveaways, plant exchanges, and maintaining the Facebook community helped participants overcome systemic barriers of cost, availability, and knowledge while creating an environment where emergent practices, such as offering rides, could develop.

Fig. 1. The diagram shows barriers that prevented participants from gardening with native plants, and the seed library sought to help people overcome these barriers. The measures used by the seed library were providing free seeds and plants (overcoming the cost barrier), frequent seed and plant exchanges (overcoming the availability barrier), and a supportive community (overcoming the knowledge barrier). The nested diagram shows additional barriers that exist because of the seed library's programming. Such barriers are addressed through program design choices and community support, but nonetheless continue to persist.



Cost as a systemic barrier

Seed giveaways were one of the core practices that all participants took part in. The practice of a seed giveaway consisted of several steps: harvesting seed for donation, cleaning seed, packaging seed, and coordinating pick-up events. Ouellette led the coordination of pick-up events, with the support of participants in the seed library. Three other practices (harvesting seed, cleaning seed, and packaging seed) were primarily done by participants, with Ouellette's support. The seed library holds seed giveaway events in the fall so that participants can sow the seeds in the winter and provide the necessary conditions for stratification and germination. The seed library also operates a plant exchange year-round coordinated through the Facebook group and hosts large in-person plant exchange events in the spring.

Availability as a systemic barrier

The seed library hosts in-person plant exchanges and Ouellette maintains a spreadsheet where participants can sign up to share plants on an ad hoc basis as a means of providing plants for people who do not yet feel comfortable growing them from seed. Some interview participants expressed feelings of intimidation about growing plants from seed. Plant exchanges and seed giveaways both address the systemic barrier of availability by making multiple native plant species available for people.

Availability was identified not only as a barrier to getting started, but also to advancing one's own native plant gardening efforts: "I was looking for shade plants in particular and it's very hard to find native plants in Ottawa. There's really no nurseries in town that specialize in native plants" (Participant 9). Participants credited the seed library with helping them overcome initial hesitation, and also being able to provide a variety of desirable plants.

Knowledge as a systemic barrier

The systemic barrier of knowledge was addressed through the use of the Facebook group, where participants both asked and answered questions. Participants said they could rely on the Facebook group for niche knowledge that may not be easily accessible through internet searches. Ouellette said she made a regular practice of sharing native plant resources several times per day in the group, including webinars, scientific papers, and articles.

Most participants in the seed library said it was their first time gardening with native plants and that their connection with the seed library facilitated their adoption of the practice. Although many reported feeling intimidated at the beginning, they said the practice of native plant gardening was easy once they acquired the requisite knowledge: "I had so many aha moments, and I'm still on my learning curve, but man have I ever learned a lot in the last less than a year and I just want to share that because this is important, and it's easy, it's super easy" (Participant 11). Participants characterized the Facebook group as both a source of knowledge and an opportunity to share things they have learned in an effort to advance the work of the seed library and spread the practice of native plant gardening.

Participants relied on information provided by Ouellette through the seed library Facebook page to select plants, manage their yards, and perform essential tasks like seed collection and cleaning. Knowledge transfer happened in three ways: peer-to-peer, top-down through Ouellette's posts, and by seeking external research. External research and resources were very important to the generation of knowledge; Ouellette told interviewers she posted only scientific sources and quoted rather than paraphrased. Her stated intention was to direct people to these resources. Peer-to-peer knowledge transfer was common, with volunteers answering questions for others at seed pickup events, event organizers providing technical information, and participants answering questions on Facebook.

Community-led system change

Ouellette said the seed library's strategy was to share native wildflower seeds and to advocate for large-scale system change, such as reforming bylaws and encouraging native plant gardening in public areas. In this way, they are both temporarily bridging barriers for participants and dismantling those barriers within the broader culture. Several participants highlighted yard bylaws, which specify a maximum height that limits the native plants that can be planted, as a barrier to greater participation. Ouellette described a desired vision for the future that would constitute a restorative culture: "...people come to each others' houses, talk about their gardens and then we build people that feel like they've met like-minded people and are hopeful for the future, and then that native gardens become the standard, and lawns become obsolete because we're so used to seeing those gardens in the city" (Mélanie Ouellette, interview 2). In order to achieve this vision, Ouellette and other participants planned and executed several in-person events, including an event to clean and pack seeds and plant exchanges.

Many participants described the work of the seed library as shared by all rather than the work of Ouellette alone. Although participants described themselves as involved to varying degrees, they did not see a hierarchy among volunteers in the seed library, though all recognized Ouellette as the leader. All work, from

folding seed envelopes to hosting seed pickups, was recognized, primarily by Ouellette through a post in the Facebook group. Ouellette described how she would split tasks into smaller pieces to make them more accessible for more people. For instance, a given packet of seed could be folded by one volunteer, packed by another volunteer (with seed donated by a third volunteer) and given away by another, allowing four people to be involved in the process. Many participants reported a strong desire to "give back" to the work of the seed library after receiving free seeds or plants.

DISCUSSION

This study focused on the operation of the Ottawa Wildflower Seed Library as a convivial community tool. We conducted a qualitative case study of the seed library to understand if (and how) a grassroots ecological restoration organization empowers people to engage in the practice, and specifically if (and how) that organization operates as a convivial community tool. We found that the seed library is a grassroots ecological restoration association that empowers people to engage in restoration by lowering the barriers to participation through top-down program design, horizontal support between participants, and emergent practices (i.e., conviviality), which makes it a convivial community tool. Members of the seed library assist one another in their efforts to access native plant gardening, which is a core feature of the organization (rather than a side effect). This lateral support between participants and the commitment to enabling people to access seeds make it a convivial community tool.

Facilitating engagement by overcoming external systemic barriers

Participants credited their native plant work largely to the existence and support of the seed library. Many participants began native plant gardening because of the seed library; specifically, they said the seed library helped them overcome the barriers of availability, cost, and knowledge (Table 1). Prior research into volunteer activity in ecological restoration has focused on motivation to participate (Ryan et al. 2001, Measham and Barnett 2008, Asah et al. 2014); however, motivation is a necessary but not sufficient condition for pro-environmental behavior change (Kollmuss and Agyeman 2002). Community-based social marketing (CBSM) is a behavior change approach that postulates lowering barriers is the key to enabling pro-environmental behavior (McKenzie-Mohr and Schultz 2014). The seed library operates by lowering systemic barriers to native plant gardening for people who are motivated to take on the practice.

Participants identified knowledge barriers around the collection and treatment of native plant seeds. Most plants native to Ontario need to experience cold-stratification prior to germination, a step that was intimidating to some participants. One participant reported trying to grow native plants prior to their involvement with the seed library, without following the proper stratification protocol, and becoming discouraged. This suggests that the seed library provides support that enables people to garden with native plants when they would have otherwise been unable to. This can be characterized as the seed library's impact, which refers to "changes that a [grassroots association] brings about, whether internally or externally" (Smith 2000:195). Smith (2000) differentiates the study of impact from "effectiveness," which he defines as how a grassroots association accomplishes its impact. The seed library achieves its impact by addressing the barriers of availability, cost, and knowledge using both top-down program delivery and emergent practices.

The top-down programs delivered by the seed library (e.g., seed exchange, plant exchange) were credited by participants as being their main entry point to native plant gardening. Emergent practices (initiatives planned and executed by participants other than Ouellette) were discussed by many participants. The term "emergent practices" is often used at the macro scale in the volunteering literature to refer to spontaneous post-disaster aid, such as community search and rescue groups (Twigg and Mosel 2017). At the organizational (i.e., meso) scale, this term refers to individual participants performing actions that further the goal of the seed library, independent of instruction from the founder. For instance, several participants organized an event to rescue native plants from a planned development site. One participant created a bin for people to drop off donated supplies. Another participant regularly picked up and dropped off materials in an area of Ottawa she frequented. Participants frequently turned to the seed library community with questions, seeking collaboration or making offers of assistance (Table 2). This kind of emergence was enabled by Ouellette in her administration of the Facebook page, which provided a safe space for community members to interact: "On the Facebook group, I'm pretty tight about it. It's so I have certain rules like everybody being positive and we don't accept invasive species [...] And I've set the tone that I always share evidence-based information with quotation marks, and references, and I find people are pretty good at doing that..." (Mélanie Ouellette, interview 1). Although Ouellette characterized her leadership style as that of a "benevolent dictator," no participant complained of heavy-handedness or micro-management in her leadership of the seed library. Many participants remarked on how receptive Ouellette was to their ideas and initiatives, something which contributes to the conviviality of the organization. Participation in the seed library was task-oriented, done by small groups, and featured a high degree of communication: three aspects of informal structures highlighted by Freeman (1972) as conducive to effective collaboration.

Operating as a convivial community tool

The central role of emergent practices in the seed library, and the overall strategy of overcoming barriers, are core organizational practices that support making ecological restoration a convivial community tool. In much the same way that a communal bike repair workshop enhances the conviviality of an already-convivial tool, the seed library takes something already theoretically accessible to everyone and makes it practically accessible (Bradley 2018). Illich posited that some tools (e.g., bicycles) are inherently convivial: that the tool itself can be easily used, repaired, and maintained. In the case of the seed library, seeds are collaboratively collected and distributed, knowledge is shared by participants and organizers alike, and volunteers seek to enhance their own gardens and those of others using the tool of native wildflower seeds. Seeds do require specialized knowledge (i.e., stratification) to grow; however, the practice of collecting and germinating native wildflower seed is inherently accessible because it does not require special tools or licenses. People who have their own garden can freely collect and distribute seed from

Table 1. Systemic barriers to native plant gardening.

Barrier	Attempts to overcome	Example quote
Availability of native plants	Seed pickups at multiple locations; year-round plant exchange facilitated through shared document; wide variety of species sought, donated and shared	"I feel like they're doing a really wonderful service in in Ottawa, because before them, we all knew that accessing native plants was quite difficult and if you're relying on going to a Loblaws Superstore, you're not gonna find what you're looking for. We need to have a service like this where there's the due diligence, there's the knowledge of how to do it ethically, and how to do it locally and small batch, so that it's sustainable." (Participant 3)
Cost of native plants	Seeds given away for free; growing materials (e.g., pots, screens, soil) donated and shared; plant swaps facilitated	"You get stuff for free and it seems like such a generous thing, because normally, you have to pay for seeds, and it's quite difficult to get native plant varieties. I've went on many fruitless trips to garden centers and stuff, looking for specifically native seeds, and here they are all available to us, and very conveniently too, at different locations across the city in the fall." (Participant 7)
Native plant knowledge	Resources posted on Facebook and website; knowledgeable volunteers at seed pick-up events; collaboration and knowledge-sharing encouraged	"I had so many aha moments, and I'm still on my learning curve, but man have I ever learned a lot in the last less than a year and I just want to share that because this is important, and it's easy, it's super easy." (Participant 11)

that garden. This suggests that native wildflower seed has inherent conviviality (Illich 1973), and lends itself well to the open approach of a convivial community tool.

Whether the practice of ecological restoration should have a rigid definition, with standards and practices, or be open to interpretation has long been debated (Light and Higgs 1996, Nelson et al. 2017, Murphy 2018). The idea of conviviality has been applied to technology, and five key elements have been identified as important to the development of convivial technologies: relatedness (e.g., connection to ecological processes), accessibility, adaptability (e.g., is there a monopoly over usage?), bio-interaction (e.g., level of environmental harm), and appropriateness (Vetter 2018). Accessibility and adaptability are particularly relevant to the discussion of restoration's convivial potential. The seed library demonstrates how restoration can be made accessible (e.g., through the provision of free seeds and plants) and adaptable (e.g., Ouellette expressed willingness to share the seed library model). Participants in the seed library reported gathering with other participants for purposes not expressly organized or sanctioned by Ouellette. For instance, one member reported organizing a plant rescue with other participants (i.e., retrieving native plants from a proposed development site) using the Facebook group as an organizing platform. Such unsanctioned activity is desirable in a convivial community tool and evidence of the conviviality of the organization.

One key division in restoration has been between whether the practice is a packageable, reproducible means to an end, or a focal practice where there is value in both the process and the product (Higgs 2003). Participants in the seed library frequently talked about the value of their volunteering in terms beyond adding plants to their gardens. They viewed the project as more than just a source of free seeds; for many, it was a supportive community:

> *It's education it's community. It's knowing that there are other people out there who are like-minded, because yes, you walk into a plant nursery, and you can't find anything. My Facebook feed is filled with all of this, so I feel very supported, and I'm like there's a lot of us out there. But then I go out to a store and just like, there's nothing there! Okay, I'll go back to my underground group, my grassroots underground group.* Participant 23

Several participants in addition to Participant 23 remarked on the importance of social support to their native plant gardening practice. In contrast, research into formal non-profit volunteering has highlighted a gap, and potential conflict, between practitioners and lay people (Weng 2015). One advantage of a grassroots association like the seed library is that this dynamic is minimized.

Toward convivial restoration

The findings of this case study point toward a novel conceptualization of ecological restoration as a convivial practice: "convivial restoration." Convivial restoration prioritizes the accessibility of the practice. Leading literature for ecological restoration conceptualizes the accessibility of the practice as "engagement" in restoration projects (Suding et al. 2015, Gann et al. 2019). Engagement tends to be interpreted and studied as citizen engagement, often using Arnstein's ladder of citizen engagement, which outlines a spectrum of engagement from superficial consultation to citizen control (Arnstein 1969, Reed et al. 2018). Research into engagement in restoration uses the language of stakeholders, and models the public as involved to varying degrees but rarely owning the project (Baker 2017). Convivial restoration exists at the top rung of Arnstein's ladder, as Illich's original conception of convivial tools outlined a need for people to be able to make the tool their own (Illich 1973). Community-led restoration practices elsewhere have embraced practices like ritualization and art to enhance the human-ecosystem connection (Holland 1994). The conception of convivial restoration outlined here is complementary to those efforts in that the organizational structure emphasizes the ability for participants to take the practice and make it their own. Participants in the seed library, for example, are not required to have an entirely native garden, but can determine their own gardening aesthetic and practice. Participants in the seed library made signage for shared gardens, seed catalogues, and a scavenger hunt for Girl Guides, demonstrating how a convivial community tool can enable artistic practices (Ball 2008, Curtis 2009).

Prioritizing accessibility presents a challenge for conventional restoration: what if enhancing accessibility compromises other principles of restoration like effectiveness, efficiency, or sustainability? For example, several participants in the seed library discussed the need to maintain the image of a conventional garden by incorporating some non-native plants rather than using

Table 2. Internal program barriers.

Barrier	Description	Attempt to overcome	Example quote
Time	Participants expressed that they needed to have free time to be able to participate in seed library events and activities.	Tasks are split into smaller chunks to make them less time-consuming and provide multiple ways for people to engage with the work.	"I didn't feel like I had the time or the means. They were all doing such beautiful little seed packets, so I just chose to do an easier, really time commitment, was purchasing stamps." (Participant 3)
Seed and plant knowledge	Participants often expressed feeling uncertain about seed sowing or plant identification and said that knowledge could be a barrier to participation.	Information is provided through the Facebook group. Volunteers are present at events provide guidance. Ouellette dedicates one-on-one time to help people get started.	"I'm a bit nervous. I'm not that great of a gardener. Any time they've talked about stratification or all that like it all seems so complicated to me like having to like freeze things or make sure they get really cold, I kind of panic, but I'm hoping that maybe next year, [...] my kids will be a bit older, I'll be able to maybe spend a bit more time learning about the process. I don't want to kill all these seeds that somebody else might be able to make live. If I end up doing it, I want to do it right." (Participant 24)
Transportation	Getting to seed pickups and plant events can be a barrier for some participants.	Seed pick-ups are planned throughout the city, in locations accessible by transit. Ouellette offers to mail seeds to those who cannot attend.	"Again, the biggest [barrier] would have been transportation. So the events were held, I think there were five events that were held, and they were all in different parts of the city, so that the idea was, try and make it as accessible as possible to people that they could even just walk up to these things. But in order to participate in them you had to drive to get there." (Participant 11)
Garden space	In order to grow the plants, participants need access to some sort of outdoor space.	Connecting participants with one another to garden in shared spaces. Providing plants and resources for container gardening.	"You need to have, probably, you need to have your own garden, which means you need to have access to land. Or I suppose it's possible that you could definitely go into wild spaces, parks. But I believe it's, it's difficult to access a lot of different species. You know, you'd be limited to the kinds of species you could donate if you were only going to collect from wild areas." (Participant 2)
Physical ability	Some tasks, such as handling small seeds, may contain barriers for people with disabilities.	Task splitting has been used to make some tasks more accessible (e.g., people who do not have the dexterity to sort seeds may be able to fold seed envelopes).	"Some of the seeds being so small it's kind of, you need some dexterity to be able to grab the seeds and put them in the put them in the envelopes. But again, most seeds are big enough that it's not an issue." (Participant 11)
Internet access	The seed library primarily operates through Facebook and its website, which may be a barrier for people who lack technology skills or internet access.	Present at events to provide outreach.	"The fact that it's mostly Internet-based I guess might not be completely accessible to everyone, both from a like a computer or technical skills component." (Participant 16)

exclusively native plants. Such a garden would not qualify as restoration under the International Standards for the Practice of Ecological Restoration (Gann et al. 2019), yet it is still a practice that is contributing to enhancing the ecological integrity of an area. Convivial restoration aligns with critics of Gann et al. (2019) who have argued for a principle-based definition of restoration that is more flexible (Higgs et al. 2018). Further research is needed to develop principles that maintain restoration and allow for the flexibility required to make it a convivial community tool.

Future research directions

This case study provides preliminary insights into two key elements of a convivial community tool: programs that lower the barriers for participants to access the tool, and emergent practices that do the same. This research presents a snapshot of a seed library at the early stage in its lifecycle. It would be beneficial to study convivial community tools that have been around for a longer period of time. This may reveal whether they were able to shift the norm, and what impact that had on the tool itself. Many of the participants in this study spoke about their own gardens, but some were active in community pollinator gardens, as well. Such collaborative garden initiatives should be further studied as potential meeting places to build social capital for a restorative culture, taking into account similar literature on community food gardens (Glover 2004). Large-scale research into volunteers taking initiative within organizations could provide fruitful insights into how widespread emergent practices are and what can be done to encourage them.

This case study did not assess the quality of the restoration work being done by the seed library (e.g., the number of plants planted, the number of seedlings that make it to maturity). A productive area of inquiry would be whether and to what extent convivial restoration is effective compared to large-scale, organization-led restoration. Research comparing volunteer-managed areas with those managed by city staff in Chicago found biodiversity was similar in volunteer-managed areas, suggesting volunteer restoration efforts have a high degree of effectiveness (Heneghan et al. 2020). Such a study could employ a quantitative assessment of the ecological outcomes of citizen action in comparison with the outcomes of organization-led projects.

CONCLUSION

The Ottawa Wildflower Seed Library addresses three major systemic barriers to native plant gardening: cost, availability, and knowledge. The seed library emphasizes accessibility by ensuring that it puts up minimal barriers when creating and executing programs. Ivan Illich did not provide a blueprint for a convivial community tool in *Tools for Conviviality*, but the case of the seed library shows that operationalizing the idea of a convivial community tool involves addressing barriers people face to accessing that tool.

As restoration ecology develops as a scientific field, and ecological restoration grows as a profession, it is vital that community-led restoration also grows its reach and efficacy. This research serves as a foundation on which to further develop an understanding of

community-led efforts to enhance ecosystem integrity. Although top-down, non-profit led volunteering can provide valuable experiences, grassroots associations like the Ottawa Wildflower Seed Library can both bridge and dismantle barriers, pushing for systems change.

Author Contributions:

TA conceived, designed and executed the research, TA wrote the original manuscript, SD provided edits and guidance on the manuscript process.

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Data Availability:

The Codebook used for analysis is available on Borealis: https://doi.org/10.5683/SP3/D6SJTI.

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Appendix 1 – Interview schedule

Construct	Question	Probes/Notes
General	What is your age and primary occupation?	
General	How long have you been volunteering with the Ottawa Wildflower Seed Library?	
General	What inspired you to start volunteering with the Ottawa Wildflower Seed Library?	
General	Can you tell me what kinds of tasks you do while volunteering with the Ottawa Wildflower Seed Library?	Activities identified here will be explored in-depth below.
General	What does ecological restoration mean to you?	Would you call the work you do with OWSL ecological restoration? Are you familiar with the Society for Ecological Restoration?

Now we are going to begin the main portion of the interview. You identified several tasks that you do while volunteering with the OWSL. I will go through several questions for each task you do. Please provide as much detail as possible when answering each question.		
General	Walk me through what [Identified task – e.g. Seed Collecting] involves.	Where did you go? Who organized it? Did you need to get any permission? Why were you collecting seed? Where did the seed go? How many times did you engage in seed collecting? How much was collected?
Adaptability	While doing this task, did you learn skills that you could or have used elsewhere?	Would you feel comfortable using those skills to help other projects? Would you feel comfortable teaching someone else?
Adaptability	Would you feel comfortable engaging in the task outside of an organized event?	Have you engaged in the activity outside of the organization?
Sociality	Were there opportunities to socialize while doing the task?	How were those opportunities structured?
Sociality	Did you meet new people or deepen connections with existing friends?	Was there adequate time for socializing? How much of the focus was on getting the work done versus spending time together?
Sharedness	How many other people participated in the activity?	
Sharedness	What kind of recognition was given for the activity?	Was that recognition given to all or to one or two people?

Accessibility	Were there any restrictions on participation?	What were those restrictions? Was there any training or measures that would allow people to participate?
Accessibility	Do you think there are barriers to participating in this activity?	What are those barriers? Is there any effort to help people overcome them?
Accessibility	Would you describe participation in the activity as equitable?	For example, who might be excluded from participation?
Transparency	When doing seed collecting, do you feel you understood why you were doing it and to what ends?	
Transparency	What kinds of questions did you have about the activity?	Were there any questions you did not have answered?