



The Ripple Effect

Cultivating Lawn Alternatives in the Minnehaha Creek Watershed District

A Collaborative Project by
Qualitative Research Methods
Supervised by Professor Dan Trudeau
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Table of Contents

<i>Executive Summary</i>	iii
<i>List of Authors</i>	v
<i>Acknowledgements</i>	v
<i>Introduction</i>	1
<i>Methods</i>	2
<i>Survey Overview</i>	5
<i>How do residents relate to their yards?</i>	10
<i>What would it take for residents to cultivate lawn alternatives?</i>	17
<i>How do ideas about lawn alternatives spread?</i>	25
<i>Conclusion</i>	32
<i>Recommendations</i>	33
<i>References</i>	35
<i>Appendix 1 – Survey Instrument</i>	A
<i>Appendix 2 – Interview Questions</i>	C
<i>Appendix 3 – Photographs used for Elicitation</i>	E
<i>Appendix 4 – Characteristics of Resident Interview Participants</i>	I

Executive Summary

Water runoff from roofs, patios, and lawns greatly impacts the wellbeing of an ecosystem beyond just property lines. It can negatively affect local streams, rivers, and lakes by distributing a range of materials that greatly damage the vitality of local flora and fauna. Minnesota is a state of particular importance as it is home to the headwaters of the Mississippi River. Due to toxins in man-made compounds, aquatic habitats downstream are being polluted and damaged, making the river inhospitable to local wildlife. While many of these pollutants can be attributed to industry, individual households contribute to degradation as well. However, they can also mitigate these practices by keeping their water contained on their property. The Freshwater Society tasked Professor Dan Trudeau and his Qualitative Research Methods course to investigate how people relate to their yards, how people cultivate lawn alternatives, and how these spread. The goal of this study is to document the responses and provide those within the Master Water Steward Program a more comprehensive look at what can be done to reach more people. The analysis in this report was conducted through a series of qualitative inquiries of the Master Water Steward Program and the ways in which residents in the Minnehaha Creek Watershed District relate to, manage, and change their yards.

To demonstrate the breadth and viability of our research, we conducted surveys and interviews. We first administered a survey that asked residents about their yard care practices, how they interact with their yards, and their knowledge of yard care alternatives, in order to gauge perceptions of yard care alternatives. Next, we interviewed six Master Water Stewards of the Freshwater Society to assess their knowledge, engagement, and perceived impact as Stewards. Finally, we interviewed a series of residents to further explore how they relate to their yards, the barriers to cultivating lawn alternatives, and how lawn alternatives spread. The interviews with residents included a photo elicitation segment to see how residents respond to different types of yard care practice.

The research conducted in this study has revealed several important findings regarding not only how residents interact with their yards, but also personal reasons as to why they do these things. First, we found that each individual resident has different values and treats their yards in a variety of ways, but it is important to understand that all of these residents have shared values as well. The most important of these include a common sense of responsibility to the neighborhood, responsibility to help clean up and maintain the environment, as well as a general appreciation of yard practices that foster personal fulfillment and quality of life. All of these shared values are connected to resident ideals of a low maintenance yard that provides a space for both individual and community activities.

Through this study, we found that there is a lot of overlap between resident values related to their yards and resident interest in alternative yard practices, particularly rain gardens. However, there is a clear disconnect that can be concluded from this research; as interested as residents may be in installing rain gardens, there are many visible and invisible barriers that prevent any real yard changes from occurring. One example of a visible barrier would be a resident's lack of funding to

install a rain garden without assistance, while an invisible barrier would be the presence of underlying social pressures from neighbors to maintain a nice, green, velvety lawn spanning the majority of the yard. All of the barriers discussed in this report play a role in inhibiting the mass transition from turf grass to other types of yards that foster better water management.

We also have discovered that there are certain enablers that are more likely to engage residents with alternative yard practices. Specifically, the existence of a catalyst that fully enables a resident to make changes to their yard appears to be the most direct way for rain gardens, permeable pavers, etc., to be incorporated into residents' yards. This catalyst to cultivating yard alternatives is often a community leader who has the connections and resources to bring a large-scale installation project to a city block or neighborhood. The Go Blue project near Diamond Lake is one example of a catalyst that allowed residents to embark on individual installation projects in a collective manner. By bringing many residents together to create widespread agreement about a community's yard ideals, these catalysts enable social change that may not be accessible to individuals alone.

The findings in this report can be used to create highly effective strategies that may persuade residents to turn their backs on turf grass and embrace the new normal of rain gardens and other environmentally friendly yard components. The first step in devising these strategies is to understand that there exist misconceptions about rain gardens. For instance, many residents believe that rain gardens are very labor intensive and that they are therefore not worth installing. One thing that can be done to counteract this is to simply educate residents so they understand that rain gardens do not require much more maintenance than turf grass, and can often be no work at all once the rain garden has been fully installed and situated. Furthermore, the influence of community leaders on resident actions can be integrated into strategies for changing how yards look. Connecting Master Water Stewards directly to these community leaders, for example, could form a robust partnership in which both the water steward and the community leader can learn from each other and help each other spread awareness of lawn alternatives.

Changing the way residents think about their yards is not an easy task. While some residents may be more aware of water quality issues and alternative yard options, this does not mean that they are willing or socially/mentally/physically prepared to make changes to their yard. Other residents may not even understand what a rain garden is, let alone why they would install one. The findings in this report are meant to aid the Freshwater Society and the Minnehaha Creek Watershed District in informing these residents about how and why rain gardens and similar projects can be beneficial. Through the data collected and the subsequent analysis, this report is meant to provide insights that were previously unknown or not fully understood. Finally, it is our hope that this report provides enough substantiated information that our partners can move forward with their goals of cleaning up Minnesota's water bodies, one rain garden at a time.

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Introduction

During the fall semester of 2015, Dan Trudeau's Qualitative Research Methods course collaborated with the Freshwater Society (FWS) and Minnehaha Creek Watershed District (MCWD) for the third and final year of their partnership with Macalester College's Geography Department.

The scope of our research specifically focuses on the Freshwater Society's Master Water Stewards (MWS) three-year pilot program. Modeled after successful Master Gardener programs, the 50-hour intensive MWS program certifies community members to educate and advocate for clean water throughout various communities in the watershed, including a capstone project at the program's end. To acquaint ourselves with the area, we took a field trip to the eastern side of the MCWD in September, and made several visits to South Minneapolis to conduct surveys and interviews on site.

To narrow the scope of our work, we chose to examine people's reactions to lawn alternatives. Assuming the default is a turf grass lawn, a lawn alternative would be a creative, environmentally friendly replacement. This includes rain gardens, but also less visible measures like rain barrels and cisterns. Additionally, we partially framed our research in regard to MWS capstone projects, most of which employ lawn alternatives. This framework allowed us to further relate their work to the process of how ideas and information spread, providing us important insights into the long term impact of the MWS program.

This report is organized thematically, according to our three overarching research questions. At the outset of the course, our class determined three areas of study that we thought would provide a broad understanding of the way in which the MWS program has impacted the Minneapolis neighborhoods within the watershed. The first of these areas of study concerns how residents relate to their yards. In asking this question, we sought to gain an understanding of not only residents' physical yard care practices, but also the responsibilities they feel (neighborhood, family, environment, etc.).

Our second area of study concerns the practical question of what is necessary for residents to cultivate lawn alternatives such as rain gardens. We wanted to understand the barriers present for residents as well as what gave those individuals who installed a rain garden the push to finally do so. The MWS program is centered on the idea that having individuals in a neighborhood with expertise in water management should make the process of installing lawn alternatives simpler. Another goal in asking this question was to see the ways in which residents become aware of the MWS program and individual Stewards.

Our final area of study concerns how ideas about lawn alternatives spread. Essentially, we wanted to gain a deeper understanding of the diffusion of lawn alternatives. This question bears direct relevance to the mission of the MWS program, and knowledge of the methods of diffusion grants insight into the best points of entry for the Water Stewards.

In order to answer our three thematic questions, we employed qualitative research methods. Data took the form of residents' citations of personal experiences, attitudes, and beliefs. The

insight gleaned from this type of research allowed us to see all facets concerning people's experiences with yard management.

Methods

As a preliminary stage of research, we gained familiarity with the Master Water Stewards program through a comprehensive tour of the Minnehaha Creek Watershed with the Freshwater Society in which we visited key sites and capstone projects. Following the tour, we met with Freshwater Society Director of Programs Peggy Knapp for a better understanding of the goals and challenges of the program and to develop questions for further research. By the end of the research, we had collected 68 survey responses from respondents distributed across two South Minneapolis study areas detailed below, and conducted 22 interviews: 16 follow-up interviews with survey respondents (referred to in this document by numbers 1-16) plus 6 Master Water Stewards (referred to in this document by letters A, B, C, D, E, F). We reference specific interview respondents in the text by, for example (IV 9).

To initiate the research, we conducted semi-formal walking interviews with six Master Water Stewards from dispersed locations around the district who were pre-selected as key informants. Each pair of researchers met with a Steward, who gave us a tour of their capstone project, yard, and surrounding blocks. We framed these initial interviews using the following six themes: personal background, personal actions as a Master Water Steward, neighborhood and neighborly relationships, reflection on the Master Water Stewards program, capstone projects, and continuing outreach efforts. This gave us a chance to observe the program in action, and we were able to gain a sense of the most salient themes to research in depth.

Simultaneously while we were developing the next phase of research, our class met three times each week during which we engaged with previous research on lawn culture (largely informed by Paul Robbins' (2007) *Lawn People*), behavior change theories, and qualitative research analysis methods, including ethical research considerations and guidelines which we applied to our own research.

Based on all our initial information, we approached the continuation of research by working towards understanding three related themes: (1) How residents in select neighborhoods in the watershed district relate to their yards, (2) what it would take for residents to cultivate yards that exhibit deliberate water management features as an alternative to turf grass lawns, and (3) how ideas about rain gardens and other water management spread within communities. We designed a brief (3-5 minute) survey to distribute to residents to collect information on these themes while also allowing us to reach residents responding to the survey who would participate in in-depth follow-up interviews. The door survey contained questions about yard care practices, most valued yard features, and referred to an image of a typical local rain garden to which respondents were asked to give their reactions.

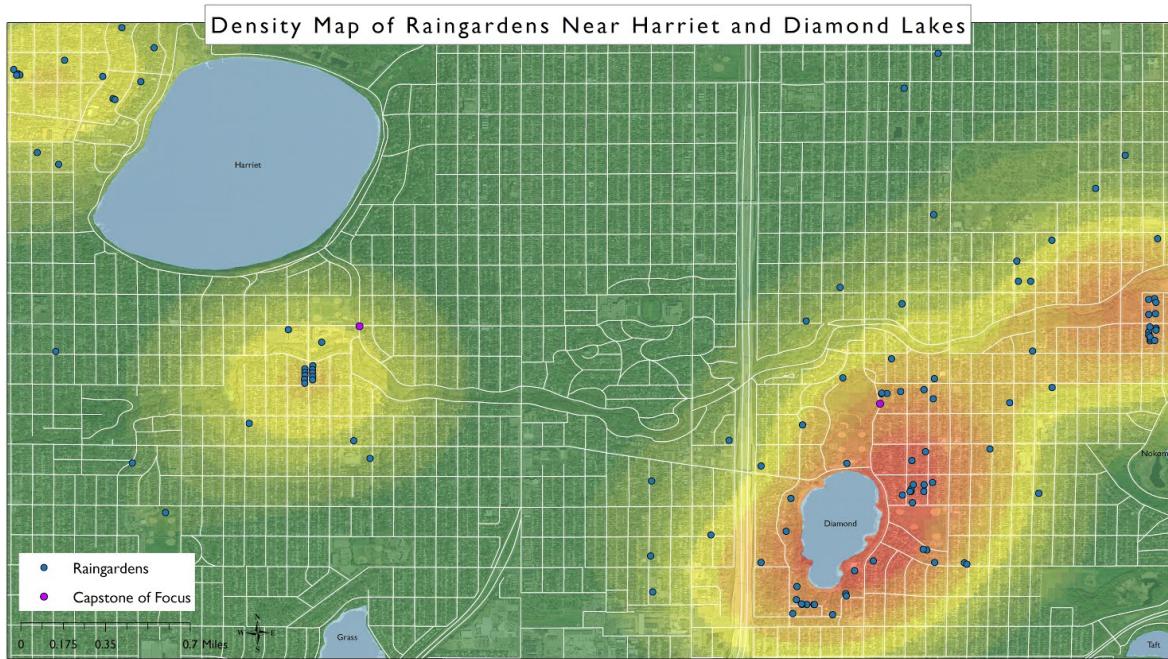


Figure 1. Location of rain gardens in south Minneapolis. Source: data courtesy of Metro Blooms

We selected two areas of South Minneapolis on which to focus our research. We chose two neighborhoods similar in demographics, proximity to the creek, and geography, each defined with a 3-block radius around a Master Water Steward's capstone project in the area. The main distinguishing feature between the two areas was that the area around Diamond Lake has seen much greater uptake of rain gardens than the area Southeast of Lake Harriet, as shown in Figure 1. The hypothesis that framed the next stage of our methodology was that we would find some differing set of conditions between the two areas that explained the gap in uptake.

Over the course of two weeks, all twelve students went out to the sites in order to collect data by knocking on residents' doors and asking them to fill out a survey. The only demographic information included on the survey was length of residence— it was not linked to respondents' identities. By filling out the form we assumed their written consent, and the survey also included a section in which they could indicate if they would like to participate in a follow-up interview.

In total we contacted 269 households (127 near Lake Harriet, 142 near Diamond Lake), spoken with 105 households (52 near Lake Harriet, 53 near Diamond Lake), and collected surveys from 68 households (34 in each study area), for an overall response rate of 64.7%. A small proportion of respondents filled out an online version of the study, an option that was given if residents were unavailable at the time. A copy of the survey is available in Appendix 1.

In total, we conducted 16 follow-up interviews with survey respondents. In each case, the interview was conducted at the respondent's home and lasted for about an hour. These were structured similarly to the Master Water Interview interviews, focused on the same themes as the survey, with the addition of a tour of their yard and a photo elicitation section, in which interviewees were asked to give their reactions to each of 6 images depicting different types of

lawns and yards in Minneapolis, chosen from a pool of photo we had previously collected. A list of interview questions and copies of the images are available in Appendix 2 & 3. While the nature of the research led to self-selection of participants with interest in environmentalism and water management, the population of interviewees included people with a variety of yard values, practices, and connectivity to water management information. Characteristics of the resident interview subjects are given in Appendix 4 and may be referred to contextualize quotes included in the remainder of this document.

With a wealth of unprocessed information from the field work, we proceeded to analyze the material using thematic coding. Our approach is based on a framework created by King and Horrocks (2010) and is further informed by Hay's (2010) *Qualitative Research Methods in Geography*. We developed matrices for descriptive codes initially, moving on to analytical codes. Whereas the descriptive codes solely describe certain phenomena in the interviews, the analytical coding moves a step further and tries to include the reasoning and possible explanations behind these phenomena in the codes. We coded around seven different questions:

1. How and why do people become involved in the Master Water Steward program?
2. How has learning to be a Water Steward affected their yard care practices?
3. What did they decide to do for their capstone projects and why? Consider location as well.
4. What sorts of things do people do as a Water Steward?
5. What do participants find rewarding or challenging about the MWS program?
6. What changes in their (capstone project's) neighborhood have they noticed?
7. How have Water Steward activities been received by residents?

We re-divided ourselves up into three teams to examine these questions, with each team consisting of at least one person that had previously focused on either the Master Water Steward interviews, the resident interviews or the surveys in order to include information from all our data sources. For each question, a separate framework was developed by incorporating the theories that were presented to us over the course of the semester. Our final recommendations and conclusions were developed by sharing our research results and finding common themes amongst the separate answers to these questions.

Our approach to researching these questions allows us to make some knowledge claims and yet there are also limitations to these claims to consider. We focused on two specific neighborhoods that were comparable demographically. Both are majority white and dominated by owner-occupied households with above median household incomes. The households in these areas also had comparable age profiles and educational attainment. While we present some statistical information about the respondents as a whole, we cannot claim that these are generalizable to the entire population of households in the watershed. We can claim with confidence, however, that our conclusions are largely applicable to more affluent, white homeowners with a college education. Moreover, our research is primarily qualitative in nature, meaning that its strengths focus on social process and human experience. And to the extent that we generate conclusions about how ideas spread, we do not claim that the processes we describe is an exhaustive list that applies to the

entire watershed. Indeed, it is important to acknowledge that our study of processes and experiences is informed by a self-selecting group of residents who often had a particular interest in yard-related issues and thought they would have relevant things to say. In addition, we must also recognize that how ideas about lawn alternatives spread among people living in different areas with different situations and priorities will be very different. With these limitations in mind, we will turn to our research design process and results.

Survey Overview

Door Knocking & Distribution of Survey

A total of 68 residents responded to the survey, 34 in each of two study areas. Of these, a small portion of residents filled out an online version of the survey instead of a hard copy during the door knocking elicitation. Responses to the online form were high, however, different, from the physically distributed copy. Open ended response questions online typically yielded much more informational, much longer, responses from those who filled them out, making the ease of computer response clear. *Figure 2* shows how the respondents were distributed throughout the study area, as well as where water steward capstone projects are located.

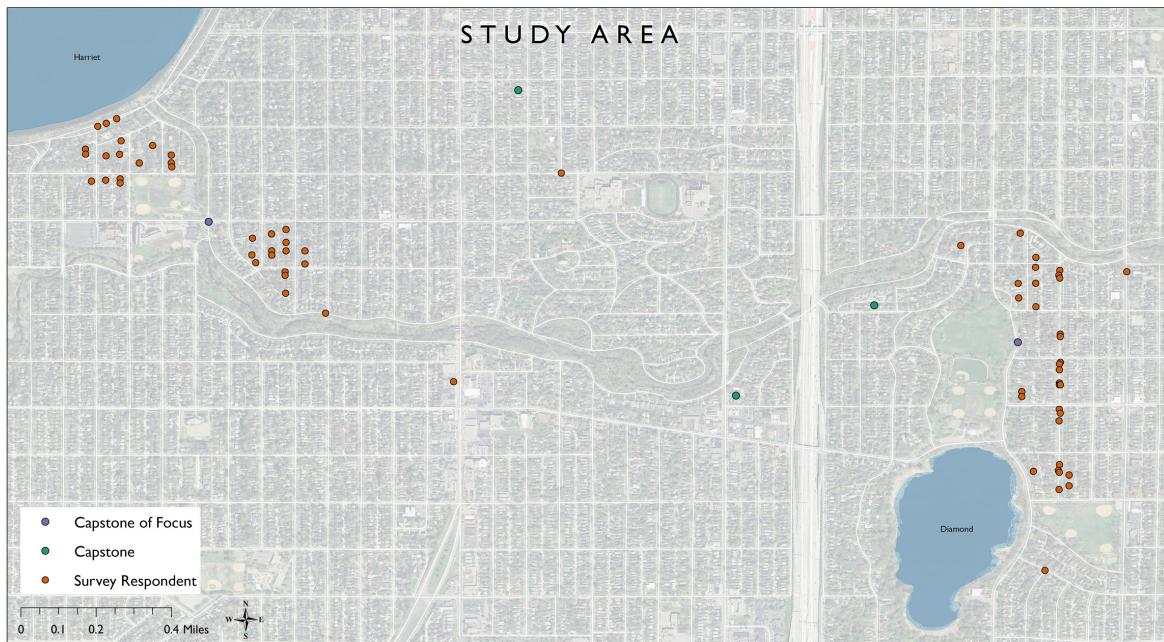


Figure 2. Location of survey respondents. Rain garden location data courtesy of Metro Blooms

Description of Survey Questions

The survey consists of a brief set of 10 questions with a mix of close-ended and open-ended responses. Questions covered three different topics to learn specific information about the household, its yard care practices, and perceptions and attitudes about yard care practices in the surrounding area. The survey includes one question that employs photo elicitation. We showed respondents a color photograph of a kempt rain garden and recorded their reactions to the image. Both the survey and the image are available in Appendix 1. All together, the questions speak to each of our overarching research questions and we integrate specific data into our analysis of these questions in a later section. In this section, we give an overview of the results.

Responses to the Survey Questions

Section A: Getting to know you and your household

Responses to this section of the survey were very complete and straightforward, as the information requested was clear and applicable to all residents. The average number of years residents had lived in any of the homes in the survey area was almost 12 years, indicating the relative newness of the neighborhood. The vast majority of residents were homeowners, only 5 of 68 respondents rented.

Section B: Your Household's Yard

One of the questions in this section records the array of information sources respondents consult in forming yard care practices and further asks them to gauge the usefulness of each source. To calculate average usefulness for each information source, the sum of the scores, ranging one through five, was divided by the number of respondents that found the source useful. By this metric, family was the most useful, with an average rating of 3.62 out of 5. Additionally, it was the most common, with 50 of 68 respondents marking family as a useful source of information. Second in rank came the internet, with 40 of all responses indicating they found it useful. The internet proved to be less useful than family in average rating, at 3. Question #4 saw very few respondents write in other answers, only five respondents filled in answers. Of those five, four mentioned Metro Blooms or Master Gardener programs. Table 1 below offers all information sources' ratings and the percentages of residents that found them useful.

Table 1. Responses to survey question 4, n=68

Which of the following sources of information do you use in caring for your yard?		
Information source	Percentage found useful	Average rating
My family	73.5	3.6
My friends	55.9	3.2
My neighbors	57.4	3.0
Lawn care company	54.4	3.1
Garden / hardware store	55.9	3.2
University outreach	36.8	2.0
Watershed district	27.9	1.7
Master Water Steward	25.0	1.4
Internet resource	58.8	3.0
Gardening book	51.5	2.2
Other	11.7	2.3

Question #5 prompted residents to write in which features of their yard they valued the most, and was the first to have its answers coded and categorized. Eleven codes were defined to class responses into groups. First, and among the most common, were a series of responses taken to indicate the importance of lawn: green and grass. Twenty percent of all of the answers coded mentioned grass in some regard. The second largest section of responses were coded as valuing outdoor recreation or function of the yard for an outdoor activity, be it playing with young family, cooking, or pets. The code was designed to include passive yard features that enable certain outdoor activities, such as fencing and patio. Within recreation, there were two sub-codes: play and outdoor living. Play was interpreted to refer to children, family and pets as being valued in yard features. Outdoor living included cooking and socializing. A second twenty percent of all responses coded mentioned recreation. The next code for these responses was plants, any answer mentioning any plantings within their yards as being important was sectioned into this code. Within plants, we created three additional codes: trees, flowers, and garden. We coded the following responses under the term aesthetic: cleanliness, appearance, neighborhood pressure, and attractive. Other coding terms included low maintenance, healthy, and eco-friendly, as well answers that marked no preference for most important feature. Table 2 below contains a more detailed summary of the frequency and percentages of coded responses to question #5.

Table 2. Responses to survey question 5, n=68

What Features of Your Yard Are Most Important to You?		
Descriptive Code	Frequency	Percent
Lawn, Green	27	24.1
Plants: Garden	22	19.6
Aesthetics	11	9.8
Plants: Flowers	10	8.9
Recreation: Play	8	7.1
Plants: Trees	8	7.1
None, All	7	6.3
Low Maintenance	5	4.5
Recreation: Outdoor Living	6	5.4
Healthy	4	3.6
Eco-friendly	4	3.6
Total # of Codes	112	100

Section C: Your Surroundings

The majority of the responses to the question #6 indicated that residents were unsure of whether or not their neighbors wanted them to fertilize their lawn. Eight residents put down either a four or a five, which meant that they were fairly certain that their neighbors wanted them to fertilize their lawn. Seven residents put down a one or a two, indicating that they did not think that their neighbors wanted them to fertilize their lawn. Another seven put down three, showing that they didn't think their neighbors felt strongly either way.

Question #7 was another open ended response, and saw residents answering in more or less positive, negative, and neutral terms. Positive responses were coded in three ways: aesthetic, environmental, and non-specified. Aesthetic comprised the largest group of responses, with forty nine percent of all reactions mentioning the positive aesthetic value of rain gardens. All negative responses mentioned aesthetics, but were the significant minority of all responses, at only four percent of all coded answers. Table 3 below displays the frequency and percentage of these descriptive codes.

Table 3. *Responses to survey question 7, n=68*

Reaction to Rain Garden (Question 7)		
Descriptive Code	Frequency	Percent
Positive: Aesthetic	34	49.3
Positive: General	27	39.1
Positive: Environmental	3	4.3
Negative: Aesthetic	3	4.3
Indifferent	2	2.9
Total # of Codes	69	100

The responses for question #8 indicated that many of the residents had seen a rain garden like the one shown in the photo. Of the 68 respondents, only 8 had not seen a similar type of rain garden (and two respondents did not answer). For question#9, a series of codes were created based on the responses residents gave. Table 4 displays the frequency and percentage of these descriptive codes.

Table 4. *Responses to survey question 9, n=68*

Would You Consider Installing a Rain Garden? (Question 9)		
Descriptive Code	Frequency	Percent
Already Have One	6	18.8
Maybe	6	18.8
Lack of Time	5	15.6
Too Much Work	5	15.6
Space Issues	4	12.5
Money	3	9.4
Non-functional	2	6.3
Need More Info	1	3.1
Total # of Codes	32	100

The breakdown of responses to question #10 (which organization's events have residents attended) are as follows: neighborhood association (30), other neighborhood group (18), Master Gardener/Naturalist (12), watershed district (4), city/district council or natural resource committee (4), Master Water Steward (3).

How do residents relate to their yards?

Self-Determination Theory

We would like to frame a discussion of our research within Self-Determination Theory (SDT). SDT proposes that there are “three innate psychological needs—competence, autonomy, and relatedness—which, when satisfied, yield enhanced self-motivation and mental health and when thwarted lead to diminished motivation and well-being” (Ryan and Deci 2000). In order to feel motivated, humans must feel competent to undertake a task and they must feel that they have control of their own actions, but they also have to feel that they are connected to a larger community. If an action contradicts any of these basic needs, people will not feel motivated. When looking at the diffusion of lawn alternatives, it is relevant to question whether enacting alternatives makes people feel that they are opting out of community ties (especially aesthetic norms) and whether people feel competent and autonomous enough to motivate themselves to act. Often, residents would comment about how they did not feel that they had enough information to put in a rain garden or other lawn alternative, and that they would appreciate outside help if they were to try. Supporting a feeling of competence and confidence about choosing lawn alternatives is one venue that could help diffuse lawn alternatives, as is supporting a feeling of community around alternative practices. Looking at resident’s relationships with their yards, we divided motivational factors in these relationships into two categories: intrinsic and extrinsic. Intrinsically motivated tasks come from a place of self-interest in the task, in other words the task itself provides a pleasure or satisfaction for the resident. In self-determination theory these tasks often have no explicit outcome or end. Extrinsic motivators are characterized by ends resulting in satisfaction imposed upon the household. We use this idea to categorize yard related tasks and help explain how residents relate to their yards.

Structure

Self-determination theory focuses to a great extent on individuals’ framed sources of motivation. Understanding what motivates individuals to complete certain actions proves to be an important point of analysis for self-determinist theorists. Motivation is often regarded as a singular characteristic in analysis of behavior; however, SDT splits motivation into several groups. Theorists divide motivation along one clear line: extrinsic and intrinsic motivators. Simply put, the dividing line between them is where motive originates. Intrinsic motivators satisfy the actor in through provision of feelings of personal competence, knowing that an act can provide increased knowledge or skill for oneself. Intrinsic motivators typically are enjoyed through process, rather than a goal oriented conclusion. Honing personal skills through working in a continual process with no clear, singular, end goal, typifies intrinsically motivated tasks. Actions considered intrinsically motivated additionally contribute to an individual’s sense of autonomy, acting for one’s own satisfaction. Extrinsic motivators typically fulfill a sense of relatedness and

connection to community for individuals, the motivation comes from an external source. Extrinsic motivators typically do have a clear goal or finality to them, making the task of completing them a chore, a means to an end rather than a process deemed enjoyable. These motivators are typically socially informed, and satisfy an individual's perceived need to comply to norms and expectations. In short, extrinsic motivators come from a place outside of the self, in direct contrast with intrinsically motivated tasks.

In our categorization of residents' relations to their yards, this distinction proved very useful. Understanding why individuals feel compelled to work on their yards at all and what potential sources of motivation for completing certain tasks was useful to our analysis of yard relations. The largest distinction from self-determination theory made in our analysis was the replacement of the self with the household, as it is difficult to ascribe individual actions within a familial group or partnership. This replacement makes the household's relations to their own yard and neighborhood as described with self-determination theory more clear.

Intrinsic Motivations

Low-Maintenance Lawns Shape Practices

Residents were cognizant of how much maintenance their yard care practices require, and shaped their lawn care practices to minimize the amount of maintenance they would have to perform. When surveyed about what traits were most important to them when caring for their yard, over ten percent of residents expressed the desire for it to be low-maintenance, which put it comparable to other categories such as the presence of flowers, trees, and a healthy yard. This suggests that residents' decisions about their yard are not motivated just by outputs (such as aesthetics, presence of flora, and recreation areas) but are also guided by inputs that would be required to create their desired yard. These two factors influence one another, as the desired appearance and features of their yard are very dependent on the amount of maintenance they wish to spend on their yard.

Eight of the sixteen residents that participated in the interviews expressed a desire to keep their yards low-maintenance, and some had changed the features of their yard to ensure that. Many residents said this came out of a wish to minimize the time that they dedicated toward it. They removed landscaping features with high levels of maintenance and replaced them with turf grass because, according to one resident who did just that, “it’s easy to maintain” (IV 1).

Another said they removed landscaping mounds a previous owner installed because the level of upkeep associated with them was too high:

“We removed [mounds] because they were too much maintenance. They had, like, mulch and everything that kind of just spread into the lawn, and every year we had to maintain it. ... Every spring, there would be tree seedlings growing everywhere in it, then you have to pull them. I mean, that was more maintenance than any other part of our yard” (IV 14).

Some residents expressed a clear dislike for yard work, and said that factored into their desire to make their lawn low-maintenance. For example, one resident said they “don’t like mowing” and removed part of their lawn because of that (IV 3) while another said they are “not a big fans of lawns” (IV 5) and were therefore not willing to put effort into maintaining one.

There is also a desire to balance the amount of time one spends on their yard with other things they consider important in their lives. For example, one resident said they performed “basic care [...] to keep the lawn green, mowed, and looking nice, and keep the leaves raked” because “I was too busy running the store and raising kids” (IV 12). If one does not consider their yard a main part of their identity, they are less likely to spend a great deal of time maintaining it.

Residents that had higher-maintenance features in their yard (such as rain gardens and extensive plantings) acknowledged that their presence would require greater efforts, and did not say these high levels of upkeep were a concern to them. One resident, who installed a rain garden and flower beds for water management and aesthetics, “fully realized that what’s going to take it to keep it looking good is continued maintenance” (IV 11). This resident installed a rain garden and flower beds to their yard, but did so recognizing that it would take increased maintenance to maintain them. They anticipated “some pretty constant, steady work to manage that area” (IV 11). Another resident said during the summer, care for their yard and all its features would take up at least an hour of their time each day. They considered that level of work a minimum, saying that if they fell behind, they would spend many hours a day working. Despite that, the resident did not say they wished to change their yard features to lower required levels of maintenance.

Although some of the residents that discussed levels of maintenance were not concerned about how much work they would have to put in their yard, these beliefs were mostly found among residents that already had lawn alternatives and other high-maintenance features (such as rain gardens) in their yard. Residents that had low-maintenance features, such as turf grass, tended to keep those features simply because they were low-maintenance. While many residents discuss responsibilities to their community (among other features) as a major factor in decisions about their yard, their desire to minimize time spent working in their yard far outweighed those responsibilities. If residents are willing to change their yard care practices, they would be willing to do so only in a way that still allows them to have a low-maintenance lawn.

Yards as Social Family Spaces

While many residents said their yards were important to them as aesthetically pleasing spaces or places for them to exert their responsibility to their community, many also said they wanted their yard to be a space where they could interact with their other family members. 41 percent of residents surveyed said they viewed their yard as a home of recreation and play, while 7 percent said they viewed their yard as a place for outdoor living. Neither of those themes explicitly implies a space where families socialize together, but it demonstrates that many residents want their yard to be a space they can use interactively, rather than inactively.

Multiple residents said they explicitly designed their yard so that children or grandchildren would be able to use it. In these cases, this meant installing or preserving turf grass as a play area.

Four residents said their children play sports in their yard, which caused them to “utilize the back yard a lot” (IV 6). Using their yards as a social space for their own children allowed them to foster community interaction, as they said that other children from the neighborhood would often join them and play in their yard too. One resident pointed to the high numbers of children in their neighborhood, many of whom would use their yard: “When the kids were little, they played softball in the backyard … on this street, were 52 kids that were this height or lower” (IV 12).

Conceptualizing yards as social spaces allowed residents to foster connections between their own household and the greater neighborhood. This often happened as a result of their children, as residents would often spend time outside if their children were doing the same. One resident said when their children played outside, they would “go to the front, and … hang out on the front steps, and then the neighbor kids kinda play, and so it’s kinda that whole front porch concept” (IV 14). When some residents spent time outside with their children, they began socializing with other neighbors through that. One said this came about because of dining outside, while others simply desired a place to sit outside and eat by themselves: “We eat out here whenever we can, we visit out here, our neighbors drop by” (IV 13). The same resident said they installed statues and other play features in their yard to intentionally attract other neighborhood children: “It’s a playful place for kids, and … as they grow up, it’s no longer so magical, but there’s always new ones that like to come over” (IV 13).

As these residents have their priorities of family spaces very established, they will often resist lawn alternatives such as rain gardens if they conflict with those values. One resident, who has three children that use the yard for playing soccer and baseball, said they were hesitant to install a rain garden as it would take away from that space. They valued open space, saying “it’s nice to have some kind of open space to run around in. And in a rain garden, that maybe isn’t the best for that” (IV 7). However, that resident expressed an interest in making some changes to their yard, such as increased shrubs and trees, as long as it did not conflict with their desire for open space.

Family members that use their yard for interaction with one another viewed their yards as an extension of their living areas, which in some cases allowed them to interact with and observe wildlife. One resident said they liked their yard, as it allowed them to sit outside “and the goldfinches will come, and of course the butterflies” (IV 4). Another said they have a wide variety of flora and fauna in their yard, and they will often “just sit out there and watch what’s going on in the front yard” (IV 3).

When residents created intentional spaces for their children, they began to consider safety as a main feature of their yard. One resident said they designed their space with their grandchildren in mind, so they could play there without running into any dangers. Another said they became conscious of chemicals and toxins that they used, as they did not want to have any “possible poisons out there for the kids” (IV 12). Not all residents felt that children should be limited to just playing in their yards; for those that had lawn alternatives and plantings, they wanted to create a connection between their children and those plantings in an educational manner. One resident said they “wanted the kids to feel the experience a little bit of growing stuff” (IV 14), and they did not

feel that the presence of children mandated an entirely turf grass lawn; rather, they could strike a balance between plantings and turf grass.

The desire to use their yard as an interactive space for family members shaped how many residents managed and conceptualized their yard. For residents that hoped family members, notably children, would use their yard, they imagined their yard less as an aesthetic space or a representation of their identity. Instead, their yards provided personal fulfillment through extending their living space outdoors. Here, yards disrupted borders of private and public space, and allowed individual residents to socialize and play with other family members and neighbors (especially their children.)

Aesthetics

Among the concerns voiced by residents when describing their interests in maintaining and interacting with their yards one of the most prevalent was their desire to establish an aesthetically pleasing space. Repeated mentions of the looks of their front and back yards indicated one of the main motivators to commit resources to yard maintenance is to create a visually appealing yard. When asked which features of their yard are most important, nearly eighteen percent of respondents mentioned aesthetics or appearance in some form. Residents expressed considerable variation in which features of their yard contributed most significantly to the overall appearance of their property, universal, however, was an underlying motive to install these features rooted in aesthetics.

Mentions of installing plantings specifically with aesthetic roundedness in mind were common: "We like gardens. My wife really likes flowers and that kind of shrubbery. And we hired her brother to design and then create these things for us" (IV 6). As mentioned by this resident, considerable effort by others was contracted to create, place, and design a garden with largely no function apart from contributing to the appearance of the landscape. Most frequently described were floral plantings, introduced as providers of color and seasonal diversity through visual stimuli: "we are going to have an incredible variety of type of plants as well as the season where they are blooming and a real variety of colors so we've got from April to November color out there – it's gonna be really neat" (IV 11).

Residents seemed to refer to aesthetic features as anything designed in addition to their assumed turf grass lawn, often quoted as describing flowers, gardens, and trees as "more interesting than grass": "I like it when there are lots of trees and plants, other kinds of tall plants other than just grass" (IV 2). Additionally: "I find that rain gardens and perennials are of more interest as far as looking at them than any of the green lawn" (IV 3). Grass is referred to almost as a baseline for the yard, a canvas for improvement and more complex plantings, and is often described as boring or uninspired, resulting in the desire to add a "personal touch" to yard management through aesthetic refining. "We had no landscaping in front of the house, and it looked kind of sad. In the summer we took some time, had some family in town, and we basically build these new beds"(IV 10). Grass' role as a standard front and backyard feature becomes clear here, but the negative connotations it has in terms of overall aesthetic are intriguing:

"We used our yard mostly as a giant planting area. We planted about every square inch we could and took out as much mowable grass as we could for plants and shrubs and trees... it's mostly a nice way for us to have some beautiful things to look at with less grass to mow" (IV 11).

This distinction between grass and aesthetics seems to place grass into a category with yard features perceived as more functional than visual, and gives signs that residents acknowledge their own commitment to aesthetic features that contribute little to the overall functionality of their yards.

Understanding the motives for installing features categorized as mainly aesthetic proves to be more complex than simply the desire to create an appealing yard. Within households, the installation of aesthetic features satisfies individual families' desires to guide a yard to meet tastes that are seemingly self informed, however, there are a myriad of other informing features that affect aesthetic choices. A series of residents were cognizant of the relationship between aesthetics, personal satisfaction, and functionality. Opinions that offered insight into these relationships can be characterized by this quotation: "So in terms of the amount of things that need to be done versus things that take care of themselves, I have myself in mind. And in terms of the beauty of looking at the flowers I have myself in mind" (IV 1). This resident makes clear the role of subjectivity of taste in establishing yard layout, seemingly enabling the placement of aesthetic preference into an intrinsically motivated grouping. Their quote also indicates some degree of personal satisfaction or hedonism, however, the previously described societal pressure to present your home as a visually appealing location looms large in the definition of taste. Which features are considered aesthetically pleasing is socially informed, however, the task of installing them satisfies no one but the residents. There is never a place where aesthetic features are "done" performing their function, there is never an ultimate state of aesthetic satisfaction, enabling these types of features to be considered more process-based, and through that, intrinsically motivated. The social nature of taste does complicate the definition of aesthetics, but does not change the relationship residents have with the tasks they complete to satisfy their own expectations and yard preferences.

Extrinsic Motivators

Social Responsibility: Small Geographies and Social Pressure

Social Responsibility is the pressure we observed residents felt to uphold normative aesthetics in the areas of their yard that can be seen by the public. Mostly, this is how people feel the need to make their yards look like they adhere to the same basic values as their neighbors. In self determination theory, this is the "relatedness" segment. People want to feel that they are related to the people in their surroundings and that the other members of their neighborhood or block approve of them.

In our coding of resident interviews, a number of residents touched on how their yards are not just their own space but somehow represent the values of their larger geographic community (block, neighborhood). Yards are a social reflection of their owners, and represent to many part of their responsibility to their community. Often, this means cultivating a lawn area that looks similar to their neighbors, especially in the more public area of the front yard. One resident described, "I feel a lot more responsibility about the front. I had some landscaping stuff done this year. I feel some responsibility because a lot of people walk by to have it look nice. I feel like this is sort of part of the landscape of Minneapolis" (IV 1)

Clearly, people do not just tend to their yards because of internal motivations, but rather because yards are external representations of themselves as "good citizens."

Even when people do not personally feel attached to lawns, because of the responsibility they feel they put time into upholding the lawn aesthetic. For example, one resident said, "I'm not a big fan of lawns myself. I grew up in California, in Southern California, and we never had a lawn and so it's been interesting kind of figuring out how little I can get away with doing with the lawn" (IV 5).

Similarly, since lawns are viewed as the norm, choosing to cultivate a lawn is safe, especially from a social standpoint:

"I think we're used to this (points to own yard) being kind of the standard, right? It's flat, it's green, it's grass, we mow it and you can run on it. Whereas a rain garden it is a little bit of a departure. So I don't think aesthetically it.. we're not used to it yet. It's not that it's not nice.. but it's just not usual" (IV 7)

"So I feel some responsibility to be part of that aesthetic. I don't feel a need to impress, but I do feel a need not to create an eyesore" (IV 2).

It appears that people feel most competent in implementing a turf grass lawn because it is something familiar, and helps them feel related to their neighbors. They feel that they are socially responsible to uphold the turf grass aesthetic in order to fulfill their civic duties as good neighbors. As we has seen through interviews, even residents that do not personally find turf grass attractive feel this underlying social pressure and act accordingly.

Environmental Responsibility: Upholding Ideals

Another extrinsic motivator that arose throughout the different methodologies was the pressure that individuals feel to use their yards in a way that upholds environmental ideals and protects the greater environment of their surroundings. Though this is ultimately a social pressure, it appears to manifest at a higher level than direct social contact. In several interviews, residents indicated a clear conceptualization of the yard as connected to a larger whole. One resident noted, "We're close to the lakes and the creek. So I don't want our stuff flushing into the other areas, so if I can help minimize it, that's all the better" (IV 3). Though not forceful, this quote indicates a clear

connection in the resident's mind between the outside environment (lakes and creeks) and their own pollution. Another resident stated "What we're thinking is we wanna have faith that the water that is coming out of our property is healthy" (IV 11), indicative of the same connection.

The link between personal action and the environment is important in determining the impact that further education will have on changing yard-care behavior. If individuals already have the connection present in the conception of their yard, then that makes the process of strengthening that connection an easier process than starting from scratch.

The connection between personal action and a broader environment did not always constitute a barrier to fertilization. One interviewee noted that they felt guilty about spraying their yards to kill weeds, "particularly because we're so close to the creek and the lake. I mean I realize these things go into the water table everywhere but you're so aware of it here" (IV 1). The same connection between the environment and personal practices exists, but it does not necessarily manifest in terms of implementation. In particular for the water stewards it is important to spend effort on ensuring that residents combine their connection between the environment and their yards as well as follow through with action.

Now that we have unpacked how people relate to their yards and the underlying factors in these relationships, what causes people to take action? In this next section, we explore barriers and enablers for residents in cultivating lawn alternatives and what this means for further action that could be taken.

What would it take for residents to cultivate lawn alternatives?

Watershed residents are, for the most part, generally aware of alternative yard practices. Yet something seems to be holding them back from making changes in their practices. Residents cited several different reasons for why they haven't made such changes including lack of time, money and space, among others. While these factors may act as barriers to cultivating lawn alternatives, we argue that there are also other, more complex factors affecting these decisions. These other factors are much less obvious than, for instance, having no money to install a rain garden. There is a much more intricate system of social influences at play. All of these influences impact residents' lawn care practices whether they realize it or not.

To answer our second research question, we examine four primary factors. The first factor is the collection of basic barriers that residents cite for not changing their yards. As stated before, this includes lack of time, money, space, etc. While we do recognize that some of these barriers may be valid reasons for various residents, there is a possibility that these reasons were also cited in order to provide at least an answer to the survey prompt. Furthermore, it is critical to note that the lack of these barriers does not enable residents to create change. In other words, just because a resident has the disposable income to install a rain garden does not mean they will do so. There are other factors in play, which affect these decisions.

These other factors are more structural in nature. Lack of agency is one factor we investigated for this study. Following the theory of self-determination, residents make the majority

of their lawn care decisions based on external pressures from their housing communities. Agency is lost due to the social influence that residents feel from their neighbors and peers. One's social standing in the neighborhood may also come into question by making a dramatic change in lawn practices. Furthermore, due to the social pressures from neighbors and peers, residents may lose confidence in any changes they wish to make to their yards.

A second structural factor is personal preference. A person's personal values and aesthetic desires may act as barriers or enablers for lawn alternatives, though we understand that personal preferences are inherently influenced by social structures. The perception of danger, whether physical or emotional, that could come to residents as a result of changing their yard practices further complicates their decision making process. Finally, some residents simply have no knowledge of how or why they can change their yard care practices.

The final factor that we will investigate in this section is moral reasoning. Several of the residents in this study conveyed issues of morality when discussing yard practices. This includes not only sympathy for water quality and the watershed but also a certain level of responsibility to foster and maintain a healthy environment. These three large, sociopolitical factors, along with the many surface-level factors, all play into the yard decisions that residents make and greatly impact how willing residents are to cultivate lawn alternatives.

Theoretical Backing

Since the 1970s environmental revolution, there has been significant research regarding the gap between having knowledge about a particular environmental practice and actually practicing an environmental behavior. While there are countless psychological and sociological models that seek to explain this gap, perhaps the most important takeaway is the rejection of the 'linear model,' or the idea that simply the knowledge of an environmental practice leads to actual environmental behavior. In other words, exposure alone is not sufficient. Individuals need to feel that they have not only the knowledge and competence to make such changes but also the necessary social support to do so. We found that in the majority of cases, residents who made such changes were also exposed to some kind of catalyst or jump starter (either something that created an outside expectation or something that removed the initial burden of installation, e.g. a partnership with Blooming Alleys).

A combination of all of these ideas is required: a baseline of interest, knowledge and resources, plus an agent to agitate someone to act on their values. The activating agent could be a water steward, if that water steward has the trust and relationship and therefore social influence on a resident. However, simply neighboring a rain garden is not enough to move someone from the camp of "interested, have the resources" to the camp of "cool, actually doing this!" The question remains, how can residents be persuaded to cultivate lawn alternatives?

Barriers & Enablers

Through our interviews with Master Water Stewards and residents of the Minnehaha Creek Watershed District, we were able to gain a better understanding of what is preventing or helping people cultivate alternatives to traditional yard care practices. These alternatives include planting gardens, planting trees, and avoiding excess chemicals - all of which help to improve the immediate watershed. There are a plethora of factors that people take into account when considering a transformation of their yard, which often serves as a material extension of their values and style. These factors may serve as barriers or enablers, depending on each situation.

Resources

Many research subjects did cite barriers and enablers to change such as time constraints, the cost of alternatives, lack or presence of viable yard space, and lack or presence of physical resources. *Figure 3* displays resident responses to the question, “Would you consider installing a rain garden in your yard?” As shown in *Figure 3*, more than 60% of those who responded cited a lack of resources (time, money, space, etc.) as reasons for why lawn alternatives have not yet been implemented. While these are definitely worth noting, they may also be regarded as obvious, straightforward factors that often have simple solutions (i.e., obtaining funding from grants) or no solutions (in the case of no yard space). Therefore, we decided to focus predominantly on the barriers and enablers that are rooted in larger structural forces. However, one should not make the mistake of overlooking more obvious factors entirely; they are still important and demand attention.

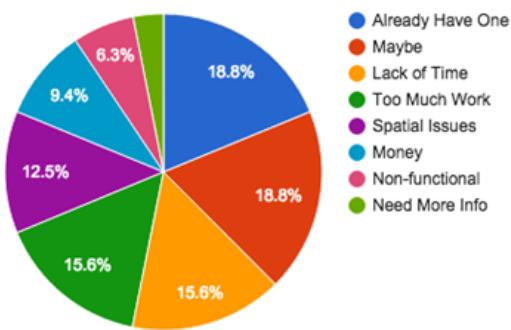


Figure 3. Summary of responses to survey question #9 - would you consider installing a rain garden?

Agency

Some residents expressed that, although they would be open to the idea of a rain garden, they simply lacked the necessary knowledge to begin. In these cases, people were often aware of the positive effects of rain gardens, but they didn't know enough to be confident in making this change:

"The number of people that we have talked to - it's surprising how many of them don't know about rain gardens or if they do, they, like most people, are probably just a little too busy to pursue or learn more about them but I think most people are made aware of the good you can do by putting them in" (IV 11).

In this case, the resident being interviewed felt that there was a lack of knowledge in their surrounding neighborhood that greatly prevented the cultivation of alternatives. With more readily available information, especially in the case of those who are "just a little too busy," rain gardens could be considered more seriously.

In other instances, people cited that they were able to transform their yards because they felt that they had both the knowledge *and* the confidence to properly employ it. Take one resident's response, in which they chose to adopt better water management features in their yard: "Because it's something we could do very easily. We didn't have to go out and convince the legislature or something or counsel member of something; it's something we could just take care of" (IV 11). This resident knows that managing water in their yard is something that they could do without the approval of local officials. Due to strong feelings of confidence and agency, managing water is something that seems easy to this resident.

On the other end of the spectrum, some residents admitted that they had simply never heard of rain gardens, or had never given them any serious thought. For example, one resident cites, "I know I would like to figure out how to catch some of the water that runs down the boulevard and we're kind of at the bottom of a hill here, and the water just pours down and I'd like to figure out a way to just catch some of it" (IV 10). Although there is a specific need for a lawn alternative, the resident hasn't connected the dots, or perhaps was never introduced to the idea of a rain garden serving as a water collector. The lack of ideas for better water management goes beyond lack of confidence in that it suggests that the resident has had extremely little, if any, exposure to rain gardens and other structures and techniques. This may be due to individual lack of awareness, but also may be due to a lack of acceptance of these alternatives within their social groups or community.

This social deterrence of lawn alternatives proves to be another barrier but can also serve as an enabler, when community members actively and visibly embrace them. In these cases, residents may choose not to alter their yard care practices in fear of being divergent from social groups. Simply put, no one likes rejection, and the fear of it may inspire people to the point of action or

even inaction. “There’s a lot of people that don’t want to do anything, or don’t want to hear, and I don’t want to spend my time on that. There’s enough people who are like ‘Oh! What’s that? Can I do it? That’s pretty! Insects! What?!’” (IV 9). This resident understands that many of their neighbors have not embraced rain gardens. However, they have found a niche within their neighborhood of people that are very fascinated with the concept, and therefore feel more inclined to develop friendly relations with them. If it weren’t for this social niche, this resident might feel out of place and therefore deterred from continuing with alternative practices. It is notable that these values can create some social groups and prevent the formation of others.

Master Water Stewards very well recognize the issue of agency and the perceived barrier of not having prior knowledge, or lacking confidence in that knowledge. As one states, “I think the knowledge base is a big problem for a lot of people. If I said I’ll do it, it’s important enough to me to put my time into it so maybe that helps people understand that it’s pretty important” (IV E). One of the major challenges of the Master Water Stewards program as expressed by the stewards themselves has been outreach to the community, and especially to those people that are not involved with water management beforehand. They are well aware of the neighborly pressure and expectations to keep the yard in a more classical style. The following quote describes a Steward’s perspective on resident behavior:

“[W]hat we really learned about in our training is that if people are going to attempt to do something, in terms of you know, prairie or something, they’re likely to start with their backyard because there’s sort of peer pressure to keep your front yard more with whatever your neighborhood does” (IV B)

The social pressures to maintain a standard turf grass lawn in the front yard, inhibits the cultivation of lawn alternatives. However, if a community’s standard of traditional lawn changed to the point that nobody had uniform, green grass, residents would conform to the new normal of lawn alternatives. This draws in notions of social influence and the feeling of belonging, which play subtle roles in each individual’s values of what constitutes a good yard.

Personal Preference

The personal preferences of residents play a major role in determining whether or not someone is likely to cultivate lawn alternatives. In many cases, residents install rain gardens simply because they find the gardens visually pleasing. At other times, they choose to install them because plant varieties bring back memories. One resident cites, “[W]e had really enjoyed our garden in Milwaukee. So even if there hadn’t been a social aspect to the neighborhood, we knew for ourselves that we wanted to see more flowers” (IV 4). The sentimental aspect of a flower garden took precedent in these residents’ decision to transform part of their yard. Sentimentality and aesthetic preference are often hard to shake, as they can be deeply rooted in one’s sense of values and emotions.

However, there are other times in which it was clear that aesthetic values weren’t so deeply

rooted, and could be shaken so long as the preferences of the community as a whole also changed. Take one resident's reasoning for not converting their "postage stamp bit of grass":

"It's totally an aesthetic thing. Ecologically it might be better to have no grass, and I would be fine with that if that was our community standard if we were just not gonna have grass because it's bad I would be fine with that, but if you want to make something look good it probably needs a little bit of grass. And the example is that kind of postage stamp bit of grass, we've got a postage stamp in our backyard, surrounded by garden, but I think the area of green, because it's not busy, it's an area of uniform texture and color, is calming. Gardens get busy, because it's a whole variety of different textures and colors and sizes the variety if it's not well planned and organized can be jarring to your eye" (IV 13).

For this particular resident, the aesthetic appeal of a green lawn is an important factor in their yard choices. It is also evident here, however, that the resident would be comfortable completely removing the turf grass if it was the accepted norm in their community. So while personal preference acts as a barrier for this resident, the potential enabler of community pressure to create change is also present.

The complexity of aesthetics and the barriers that it places on residents is well known by the Master Water Stewards. Such aesthetic preferences largely affected their own choice to plant rain gardens in their own yard. This is expressed by one steward who said, "I think it's important that a rain garden be aesthetically pleasing – but of course different people have different views so I can't say that the garden we have over there is aesthetically pleasing to everybody." This steward touches on a key point that different people have different preferences. This fact makes it difficult to entice every resident to cultivate lawn alternatives given that not every resident will find a rain garden to be aesthetically pleasing. Through interviews with both the residents and Master Water Stewards, we discovered that rain gardens are often perceived as overgrown and, even for the people with rain gardens, there are limits to what is seen as "acceptable" in a given community. So while personal preferences greatly affect the manner in which a resident cares for their yard, there are still underlying social pressures that impact these actions.

Moral Reasoning

The final factor acting as a barrier or enabler to cultivating lawn alternatives is moral reasoning. Many residents expressed that the well-being of others is an important aspect of their yard care choices. We found two kinds of moral concerns that are repeatedly expressed and are therefore notable in this study. The concerns are those of environmental responsibility and the perception of safety or danger. Many residents are aware of the environmental benefits of switching from traditional to alternative yard care practices. They understand that chemicals are bad, plants are good, and keeping excess water out of the storm drains is ideal. Some mentioned that rain gardens attract more wildlife, and, more specifically, pollinator species such as bees and butterflies. Indeed, many residents are aware of these issues and feel as though they are doing their

part to help: “Attracting pollinators is important to us – we can hardly turn around in the past five years without reading articles about the decline in pollinators” (IV 11).

Even those who maintained that they would not change from traditional grass admitted that they realized that structures such as gardens are more sustainable. Some felt the need to clarify that they didn’t have malicious intent in their refusal to change:

“[I]n the front the only time we use insecticide is when the worms come and either come after the mugo pine or the azaleas, other than that we try to make sure we don’t have the quote unquote possible poisons out there for the kids” (IV 12).

This resident acknowledges that they don’t mean harm, but subtly indicates that they are not taking environmental concerns very seriously. This does not by any means imply that the resident does not care about the environment but it may imply that the lack of action is a byproduct of living in a society that has so readily embraced a uniform lawn paired with dozens of chemicals to keep it that way.

Finally, some residents indicated that their reasons for not adopting certain alternatives had more to do with safety than anything else. For example, certain residents stated that having a lot of plants meant a lack of visibility, which could, according to them, yield accidents or even crime. “So again, with vegetation, if I can’t see my neighbor’s house, if they can’t see my yard, then we can’t see what’s going on and if it looks like something that shouldn’t be happening but when you can’t see what’s going on, you can’t record anything, so.. and even I think I got to be careful. I mean, I don’t think this is a problem [points to spot with a lot of vegetation], but if my whole yard was like that, I think it’d be awkward in terms of visibility” (IV 9). In this example, one resident holds themselves responsible for checking on neighbors, and feels as though too much vegetation (such as that which may be present in gardens) would hinder this ability and possibly make their block slightly more dangerous. The moral responsibility that this particular resident feels to keep an eye out for their neighbors acts as a barrier to cultivating lawn alternatives.

Then to conclude, the Master Water Stewards do mention their own moral reasoning as enabler for joining the Master Water Stewards program, however the trigger to join the program turns out to be those basic factors such as the resources provided by the program rather than environmental reasons. However, often the reason that made the Steward interested in the program or aware of the existence of the program, lies in the environmental interest of the Steward and their involvement in similar programs. Take the following quote:

“I worked with the NPS I work with fish and wildlife service though mostly sitting at their desk, and quite a bit of great river greening so I was already doing all of that kind of stuff and I also am a master naturalist but I learned of that through the volunteering I was doing not independently, so I read about the MWS program right away and I thought well that sounds like a really good program” (IV E)

Thoughts & Suggestions

It is important to know about these subtle, yet strong obstacles to the cultivation of lawn alternatives so that further attempts to create social change related to yard care can be carried out more effectively. This type of research and analysis is highly relevant to the Master Water Stewards because it can provide them of an awareness of the various types of forces working against them. That is, the factors that are preventing their neighbors from seeking consultation or showing interest in better water management. Through this knowledge, water stewards may be able to devise strategies for cultivating tangible results within their targeted communities. Furthermore, these findings could help with the targeting of the higher hanging fruit in the hopes of expanding water management practices to those who are not as likely to change immediately. Having said that, it is important to reiterate that diffusion of information alone is not sufficient to cause social change. The aforementioned structural factors also play major roles in the yard decisions that residents make and it is important to keep these factors in mind for future outreach and expansion.

In considering the tipping point between inserting a rain garden and not inserting a rain garden, it seems as though all the conditions are there but what is absent is some additional outside trigger or vector of change that would have to upset the equilibrium of keeping what is already there. While this has to be done quite carefully – so as not to upset agency, self-determination, or a whole host of other liberties – evidence from resident interviews strongly suggest that such a trigger might be an external expectation of having a rain garden. Consider one exchange and an interviewee's comment on the subject:

Researcher: "And to what is this [rain garden] something you would consider or could imagine modeling in your own yard?"

Interviewee: "You know if that's what we need to do we could look at that."

Researcher: "What do you mean need to?"

Interviewee: "Well I mean if that's what, you know, the best thing to do to kind of do our part for... [the environment]" (IV 14).

If the idea of rain gardens is within the realm of acceptability for a particular community, an introduction of external expectation such as an "opt-out" program by the city (less extreme than an altogether requirement) may be effective to tipping the balance.

In our case study, we determined a number of key 'vectors of change' that instigated mass installation of rain gardens such that the enabler of cultivation was the collective installation of these rain gardens. Individual residents in these situations essentially make yard changes by default rather than personal decision, due to the social community pressures to change. Indeed, while diffusion itself does not seem to be sufficient, a fruitful tactic may be to find a way to systematically activate those community vectors of change who will help rain garden installation become a default. One approach is to connect Master Water Stewards with community members who are key social mentors so that a partnership is formed where community members become the

vessels through which water stewards can funnel information and resources.

How do ideas about lawn alternatives spread?

Master Water Stewards

In an effort to better understand how lawn alternatives spread, our group found it necessary to analyze how the Master Water Stewards have made efforts to provide outreach to the local community and compare this to how residents perceive these attempts at outreach. We also thought it would be beneficial to compare the expectations of the Freshwater Society to the expectations the water stewards have of themselves. The comparisons of different expectations and perceptions are useful because it can give us a better idea of where the program has experienced the most success according those involved. Once these things have been identified, we can gain a better understanding of how ideas on lawn alternatives spread, and look for opportunities to increase the ways in which the Master Water Stewards program spreads this information.

At the beginning of this project, the Freshwater Society informed us that one of the key aspects of the Master Water Stewards program was to spread information about lawn alternatives throughout the communities they lived in and where they implemented their capstone projects. If residents are able to gain a better understanding of why lawn alternatives are beneficial, this will hopefully give them a better awareness of how it can aid the overall health of the watershed. The need to educate residents on how they can implement yard care practices that can aid the watershed is vital, as can be seen in the brief description of the MWS program in the Freshwater Society's website:

“The Master Water Stewards program certifies and supports community leaders to install pollution prevention projects that educate community members, reduce pollutants from urban runoff, and allow more water to soak into the ground before running into storm sewer systems. Wherever you live, you can make a real difference in the health of our waters” (www.masterwaterstewards.org).

After interviewing water stewards and analyzing the data they had given us, we began to see how they thought they had done in regards to the overarching Freshwater Society goals. It is clear that stewards have taken various approaches to outreach and spreading information about their work with the Freshwater Society. Yet even after these efforts, there appears to be a feeling of frustration at the lack of interest that residents show in their work. Here is a quote from a Water Steward:

“[...my friend] and I thought that we would be available to help people plan rain gardens but that hasn't happened. We really haven't had anyone say, [tone] ‘Would you help us plant a rain garden?’” (IV E).

Most of the stewards perceive, in some way, that they have a kind of duty to keep trying to reach out to their neighbors and community members to educate them on how they can do something. Yet when residents show a disinterest in the ideas (like the example in the quote above), it becomes difficult for stewards to find ways to spread their information. Residents who do show interest in the resources the water stewards can offer are usually already prone to lawn alternatives. They aren't necessarily the main group that water stewards feel they should be focusing on, since it is likely that they would adopt some type of lawn alternative eventually. This remark by a Water Steward indicates how this situation can feel:

"[...] but there's one guy who is holding out, so that's where you need to spend energy, and how can you do that? Is there enough low-hanging fruit yet to really get more bang for your buck and keep your spirits high with people that already are excited?" (IV D).

A sense of empowerment and progress are important to keeping water stewards engaged in their work as sources of community knowledge and community leaders. This empowerment can be undermined by lack of interest from residents, or even not living in the same area as where they did their capstone project. One steward noted that this was a particular issue, since they did not feel a strong connection to the project area.

On the resident side of things, there appears to be a mixed response to the efforts made by the Master Water Stewards. There are some residents who are familiar with the projects that the stewards have completed and have shown an interest in implementing their own projects. They recognize that the water stewards have the knowledge and resources to help them, and are willing to go out and approach them for assistance. Yet there are also other cases where residents do not have much information on the program, much less the services it has. When interviewed by a student about their desire to put in a rain garden, a resident responded:

"You know, I need more information about a rain garden. I would, but I don't understand it well enough and I don't know where I would put in because our yard is so small. So I would if someone could advise me on that" (IV 15).

This desire for more information on the program itself and what it could do were key points throughout this interview. This resident in particular already had a decent idea about what lawn alternatives were, they just needed guidance from an expert on how to put it in. This may indicate that one of the more effective ways of spreading of information about lawn alternatives is one-on-one contact with residents. Leading seminars and having publicity at events is good for general awareness, but it may not engage people enough to actually make them want to learn more about how they can personally get involved. Understanding the survey data that was collected by this study can give a better idea of how residents are currently getting information that encourages them to make significant changes to their yards.

Family, Friends, Businesses

Out of the 68 people we surveyed in south Minneapolis, many indicated that not only neighbors were useful in sourcing information about yard care, but family, friends, internet resources garden stores and lawn care companies also came up as top contributors (see *Table 5*). While it may seem obvious that people source information from their family and friends, it elucidates the importance of trust in cultivating lawn alternatives and how those ideas diffuse across landscapes. As interviews have illustrated, many homeowners will not make changes to their yard unless it becomes the norm wherein the whole block conforms. Interestingly, 77% of the 26 respondents who use lawn care companies as a source of information indicated that it is a very or extremely useful source, which is significantly higher than other sources on the survey (family comes in second at 61%). We believe this could be attributed to the nexus of credibility and familiarity that comes with a lawn care company employee.

While family, friends and neighbors are familiar figures for a homeowner and garden stores and books contain credible resources, the two do not always overlap the way lawn care companies do. One participant we interviewed explained that while she doesn't know much about rain gardens, she would consider it after consulting her lawn care provider/gardener, as she has developed a relationship with said provider over time, and thus trusts her both personally and professionally. It is those relationships that not only allow ideas to spread about cultivating lawn alternatives, but also actually implementing them.

While personal gardeners may be useful for many, they are not necessarily accessible for all. Lawn care providers can be very pricy, especially for installing or managing alternatives to basic turf grass. Yet it is also true that this nexus of credibility and familiarity can and has come from current Master Water Stewards, who may be a perfect alternative to those who cannot afford certain lawn care services. As we will establish, ideas spread and operate more effectively on the block level, making the Master Water Stewards program a perfect platform to transform communities on a smaller scale. Based on our surveys and interviews, it is clear that the presence of strong community leaders fosters the creativity and spread of ideas across micro-landscapes: this includes homeowners associations, townhome associations, book clubs and general community organizations. 33 of our 68 survey participants indicated that they've contacted or attended an event organized by either a neighborhood association or other neighborhood group in the past year. In addition, 39 indicated that they've contacted or attended an event organized by a watershed district, city or district council environmental or natural resource committee, master gardener/naturalist or Master Water Steward. In Robert Putnam's (2000) book *Bowling Alone*, he outlines America's declining social capital, arguing that "Americans of all ages, all stations in life, and all types of disposition are forever forming associations," and that "bridging networks are better for information diffusion." As both Putnam's book and our research suggest, neighborhood associations with strong community leaders have the propensity to diffuse ideas both effectively and on a grander scale.

Table 5. Relationship between use of information source and interest in installing a rain garden

Information source	Used this source (Total)	Indicated source as Very/Extremely Useful (percent of total)	Would consider installing rain garden
Family	47	29 (61%)	35 (74%)
Friends	35	15 (42%)	26 (74%)
Neighbors	36	15 (42%)	28 (77%)
Lawn care company	26	20 (77%)	19 (73%)
Garden store	32	17 (53%)	24 (75%)
University outreach	13	5 (38%)	9 (69%)
Watershed	7	3 (43%)	4 (57%)
Master Water Stewards	4	1 (25%)	2 (50%)
Internet	33	19 (57%)	27 (81%)
Gardening book	21	9 (43%)	15 (71%)

Community Leaders

The analysis of our interviews suggests that community leaders can be integral to the widespread cultivation of lawn care alternatives. Certain blocks in both of our study tracts pointed towards the presence of a strong community leader who helped galvanize support for lawn care alternatives on their blocks, acting as agents of change. A positive community leader can help connect residents to other resources geared towards facilitating lawn care alternatives and spark widespread involvement of programs such as Blooming Alleys. Community leaders typically have past experience with community organizing, are active among the block and relevant neighborhood association, and are perceived by other residents as credible, trustworthy resources.

The merits of strong community leadership can be placed within the context of self-determination theory. Certain indicators described in the theory that drive people to create lawn alternatives are found in community leadership, marking it as a key way in which alternatives spread. This contextualization is manifest in our analysis of resident interviews.

A key pillar to self-determination theory, which describes motivations needed for action, is relatedness. Community leaders help spread the cultivation of lawn care alternatives due to their established rapport within their neighborhoods. One resident notes his connection to a person they name as a community leader stating:

“Well I found out about [rain gardens] because [of Mark...] One day I was out front and [him] and his wife stopped by and started chatting and we got to know them and when they have garden things goin on they'll call us up and vice versa. So we - I do have a connection with *them*. Not with the rest of the block necessarily, but definitely with them. When he saw our stuff, we wanted to make sure he gets to know us” (IV 3).

Mark can be defined as a community leader because he helped every resident on his immediate block get a rain garden. In this paper we refer to this person as “Mark,” but it should be noted that a pseudonym has been chosen to protect privacy. Mark’s deliberate attempt to connect to his neighbors shows how community leaders are able to relate to their neighbors, allowing other

residents to feel as though lawn alternatives are effective and an accepted norm in their community. As described in our discussion of barriers to lawn care alternatives, social norms are often hindering residents from acting. Community leaders such as Mark who intentionally reach out to other neighbors can help break down these norms, easing the diffusion of alternatives. It is difficult to say whether other residents would have pursued alternatives had Mark not galvanized the effort, but it is clear that his presence and activism were influential to their adoption. Trusted and respected community leaders also empower residents to adopt environmentally positive lawn practices.

Community leaders help bridge the information gap and connect other residents to needed resources. In describing his pursuit of lawn care alternatives, one resident near Diamond Lake cites how a community leader on his block was crucial to the spread of lawn care alternatives:

“We had heard of rain gardens.... and didn’t think much about it until [Charlotte] proposed that to us and gave us more information we thought boy this is really the only way to go here.... It just made so much sense and it fit in with everything else we wanted to do with the backyard so... [Charlotte] seems to be the neighborhood activist...she’s doing a great job at it” (IV 11).

This resident had been interested in transforming his turf lawn to something more environmentally conscious. The community leader, whom we refer to as “Charlotte”, on his block gave him the agency to act as she provided the resources, ideas, and access to information needed to procure a rain garden. Though he can be considered an early adaptor of lawn care alternatives, he notes that if Tina hadn’t connected him to a MWS, his yard

“[...]wouldn’t be looking nearly as nice, and it would have taken maybe three, four years for us to do it...I think we would have eventually gotten to the rain gardens without [a MWS] but it just would have taken an incredible amount of work and this was so nice to have this happen quickly so now it won’t have to sit around for five years” (IV 11).

By connecting this resident to a MWS and providing other resources from Metro Blooms, Charlotte empowered him with the information and prerogative to cultivate alternatives. With community leaders, residents gain a sense of agency and competence as they are able to pool together different resources and choose to act on their own accord, maintaining autonomy.

Within our analysis, it became apparent that the mere presence of rain gardens does not aid the spread alternatives as quickly as hypothesized. Without a guiding hand, people often do not feel competent to act. This resident, while noting the high density of rain gardens on her block, does not feel moved to act because she lacks the right information:

“My neighbor up here has a rain garden in the corner and she’s worked really hard on it to figure it out. My neighbor next door to her has a rain garden back in the alley, so I think people in the neighborhood generally would like to figure out how to do it” (IV 13).

Even though there is a presence of rain gardens, we can now ask what is preventing the widespread cultivation of these alternatives. No residents on this block in our study mentioned the presence of

a community leader. Though it may be beyond the scope of our study to argue that a community leader would incite the change necessary for more residents to take up alternatives, it can be argued, in congruence of our previous analysis, that a community leader could be beneficial in providing information-challenged residents the necessary resources and support to cultivate alternatives. We see connecting to community leaders a potential opportunity for the Freshwater Society and the Master Water Stewards Program.

It seems that MWSs act as enablers – they can facilitate the creation of a rain garden, but are not always known resources. Some MWSs acknowledged in their interview the perils of pushing an environmental agenda, yet their fears of abrasiveness can be quelled through offering their services and expertise to a community leader instead. Then, information and alternatives will diffuse through the neighborhood more efficiently as the community leader is seen as a trustworthy source for their neighbors. This naturally leads to more questions, such as, if MWSs are able to facilitate the creation of a rain garden but have as a whole failed at engaging new audiences, what can be remediated as a result? How can MWSs seek out community leaders to act as a further resource? These will be crucial for the Freshwater Society to address as the program moves forward and improves its ability spread lawn alternatives and water-management practices to residents in the district.

Application of the Diffusion of Innovation Theory

It is clear that the diffusion of ideas regarding lawn alternatives, specifically rain gardens, occurs in several ways. Certainly, the Master Water Stewards carry the knowledge and experience obtained through their training, outreach, and capstone projects back to their neighborhoods. Analysis of our survey results and interviews indicate that ideas about rain gardens are heavily exchanged between neighbors as well. It must be noted that blocks with a high proportion of rain gardens appear, based on resident interviews, to be comprised of residents who are relatively like-minded and highly engaged in their communities.

In one case, one resident who has two rain gardens is a stay-at-home mother and, when asked what had attracted her to the particular neighborhood, discussed the large presence of children, friendly neighbors, and other stay-at-home mothers with whom she could socialize. Later, she described her children's various school events. It is evident that this resident had been active with her neighbors and larger community prior to installing her rain gardens. When her neighbor suggested that she install a rain garden using a grant that the neighbor had been planning to take advantage of, trust had already been instilled between the agent presenting the idea of the rain garden and the resident receiving the idea.

This example is one of many instances of diffusion, or the process by which ideas spread. Understanding the diffusion process of lawn alternatives as it occurs in our study neighborhoods is important because it may help the Freshwater Society grasp the ways in which the residents it serves obtain information and, ultimately, create notions of yard standards. *Figure 4* below is a

model of E.M. Roger's Diffusion of Innovation Theory as illustrated by the Boston University School of Public Health ("Diffusion of Innovation Theory," 2013):

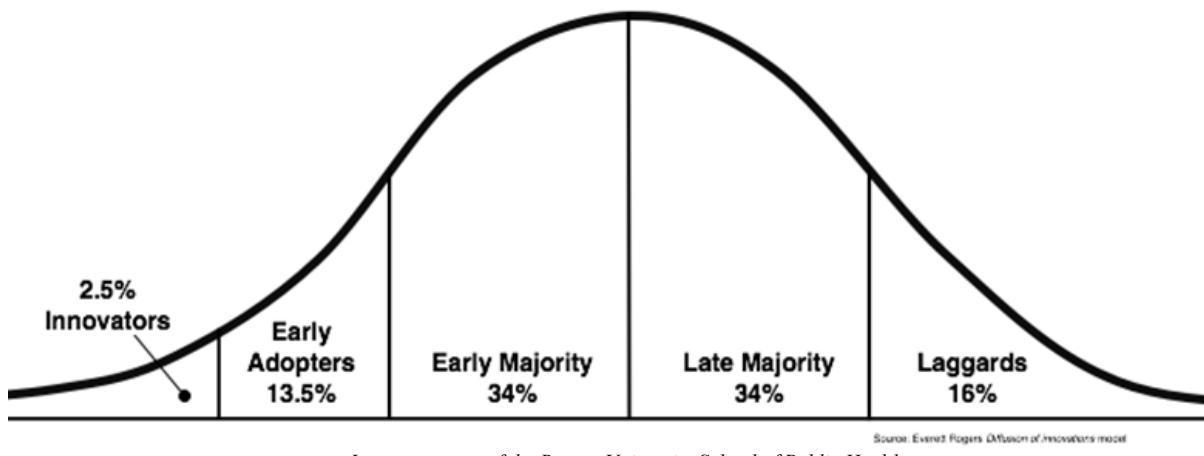


Figure 4. Model of Roger's Diffusion of Innovation Theory

This multi-stage process of diffusion can be seen in the example of Mark, a community leader, diffusing ideas about lawn alternatives to his neighbors. In this scenario, the Innovators are Master Water Stewards, people affiliated with water management organizations, and environmentalists. Early Adopters include community leaders like Mark, who brought the idea of rain gardens to his block. The rest of Mark's block is classified as the Early Majority. This group received funding and assistance from Mark. Members active in this stage of diffusion adopted rain gardens once they realized that their neighbors considered the lawn alternative socially acceptable. The Late Majority is represented by a resident who lives on an adjacent block to Mark who saw the entire block of rain gardens and then implemented one in his own yard. Note that this person primarily implemented his rain garden because of its interesting appearance and low maintenance compared to turf grass. This resident describes,

"I find that rain gardens and perennials are of more interest as far as looking at em than any of the green lawn. And I don't like mowing, but once the front and back yards were established - early on I have some Spring clean up, then I have a little bit of work in the Fall, but otherwise I really don't do much work on the front or the backyard anymore. So it's actually less maintenance" (IV 3).

Finally, the Laggards stage includes residents in this study neighborhood who do not implement rain gardens in their yards. It is also important to note the scale of the diffusion of rain gardens. Through our analysis, we observe that the diffusion of lawn alternatives operates at the block level. Additionally, we find that the presence of rain gardens is not enough to diffuse the idea. There needs to be some sort of trigger, like a community leader, to create these alternatives.

For instance, one resident - she would be described as a Laggard - explained how she has seen rain gardens on her block, wants to install one in her own yard, but does not know how.

Additionally, the high amount of activity surrounding water management and gardening that exists in Master Water Stewards' neighborhoods presents a wonderful opportunity for collaboration between the Freshwater Society and various other organizations that have goals that are strongly related and intertwined with those of the Freshwater Society. We find through interviews that many residents who have rain gardens or are interested in creating rain gardens are aware of programs such as Metro Blooms and Blooming Alleys.

Conclusion

At the beginning of this partnership, we sought to answer the three questions:

1. How do residents relate to their yards?
2. What would it take for residents to cultivate lawn alternatives?
3. How do ideas about lawn alternatives spread from person to person?

Based on the research and analysis that we performed, we have come to a few conclusions that hope to answer these questions.

While the specific practices in which residents related to their yard varied from household to household, we discovered that residents possessed common ideals that guided the ways they managed their yards. They felt a sense of responsibility to their neighborhood, which motivated them to "keep up appearances" and present aesthetically-pleasing yards that fit in with the rest of their neighborhood's yards. This social responsibility was common among many residents, and it was combined with a sense of environmental responsibility that caused many residents to adopt eco-friendly practices in their yards. In addition to being motivated by these extrinsic factors, residents of the areas we studied were motivated by values that, when included in their yard care practices, brought them personal fulfillment and enhanced their individual quality of life. These values included the desire for a low-maintenance yard, spaces for family and community socialization, and an aesthetically-pleasing landscape. Many residents saw their yards as extensions of their living spaces and places for interaction with family members and neighbors, while others saw them as spaces in which to present an identity or set of values (such as environmental awareness) to their neighborhood community.

Many residents surveyed expressed positive feelings toward rain gardens, yet were more reluctant to consider installing lawn alternatives in their own yards for many reasons. While 92 percent of survey respondents had a positive reaction to seeing a rain garden, far fewer said they could see themselves installing one on their own. For those residents to have rain gardens in their field of vision, they must overcome obstacles such as lack of time, high levels of maintenance, space for lawn alternatives, and whether they are "permitted" to install a lawn alternative in their

neighborhood. Right now, lawn alternatives are not considered mainstream, and installing one represents a neighbor potentially violating unwritten social codes about what appearances are acceptable in a yard. If lawn alternatives were considered normal, and it were expected that a resident would install one, that would greatly change how people perceive them and alter their presence in neighborhoods. These obstacles prevented many residents from considering lawn alternatives, and made them gravitate toward low-maintenance, conventional turf grass lawns that dominated our study areas.

In addition to exploring barriers to change, we also looked at catalysts *for* change: when residents changed their yard care practices or adopted lawn alternatives, what prompted them to do so? The absence of those obstacles does not guarantee a resident will adopt a lawn alternative; residents will also require active motivation that encourages them to adopt these alternatives. Residents that installed lawn alternatives said they installed them because they had a pre-existing interest in them, as well as sufficient knowledge to make their presence possible. As important as those intrinsic motivations are, the spread of lawn alternatives was greatly aided by a community member that catalyzed them to act and install it. Those community members do not necessarily need to be Master Water Stewards; as long as a community member is trusted and has social influence, they have the capacity to change people's yard care practices and potentially encourage them to adopt lawn alternatives.

Ideas about lawn alternatives spread through individual interactions with community members that are established as trustworthy, credible and familiar leaders. Most residents stated a variety of family members, neighbors and friends as sources of their information about yard care; while these sources are diverse, they all possess these similar traits of trust and credibility, and are in the same social networks as residents. Many residents pointed to specific community leaders, often but not exclusively Master Water Stewards, as reasons for their adoption of certain practices. These community leaders are skilled at engaging residents, building coalitions, and gathering support among residents. Because they have the power to make a change in a community, they can galvanize people in their social networks to adopt lawn alternatives. However, many residents said they did not have the necessary information or resources to make the desired changes to their yards; they first needed information from a trusted community leader such as a Master Water Steward in order for these lawn alternatives to spread. After a resident feels empowered to act, and has the necessary information from a trusted community member, they are more likely to make a change in their yard care practices and potentially adopt lawn alternatives.

Recommendations

After analyzing the surveys and interviews, we generated several recommendations that the Freshwater Society may choose to consider in future work. Our first recommendation is to brand rain gardens in a positive light, addressing the following three points: (1) that rain gardens are

compatible with family recreation space, (2) that rain gardens require lower maintenance than perceived, and (3) that rain gardens are largely viewed as aesthetically pleasing. Our emphasis on demonstrating that rain gardens are compatible with family recreation space stems from a number of interviews with residents who have young children, who do not have rain gardens but would be interested in installing one, and who are hesitant to install a rain garden because of the perception that it would not allow room for their children to play. Were this perception to be addressed, a number of residents with young children might be swayed to implement rain gardens.

The second point to address is that rain gardens require lower maintenance than perceived. When survey respondents were asked whether they would consider installing a rain garden, 19.2% of respondents who do not have rain gardens checked the box for "Lack of Time." 19.2% of the same respondents also checked the box for "Too Much Work." These findings indicate the perception among residents without rain gardens that this lawn alternative requires more time and labor than a turf lawn. Interestingly, a number of residents who have rain gardens noted in interviews that having a low-maintenance yard is very important to them. These residents feel that having rain gardens results in a lower-maintenance yard than that required for a turf lawn. This leads us to conclude that residents who are hesitant to install a rain garden because of the time and labor commitment might be swayed if they understand that the maintenance of a rain garden is likely less than, or at most comparable to, the maintenance of a turf lawn. Rain gardens do not require more work than turf grass, just a different type of work that residents without rain gardens would need to learn.

Our third point is to capitalize on the perception indicated by our research participants that rain gardens are aesthetically pleasing. We want to highlight that residents in our study areas generally see rain gardens positively, describing an example image of a rain garden with words such as "beautiful," "pretty," and "healthy." The look of this lawn alternative is not a barrier but rather something many residents, both with and without rain gardens, view as aesthetically pleasing.

We recommend policies and programs that will disrupt the idea of a turf grass lawn as a mainstream idea, and lawn alternatives such as rain gardens as abnormal. One of the main shapers of resident's yard care practices was a desire to fit into the social expectations about what a "normal" yard looks like; this dominant idea of turf grass lawns as normal prevents individuals from violating that norm and installing rain gardens, as they fear it will cause resistance in their community. We are unsure what a concrete solution may look like in this case, but we recommend promoting rain gardens through a policy approach, so that residents begin to conceptualize them as a standard yard practice that is an expectation in their community rather than a violation of values.

Our final recommendation is to take advantage of the opportunity to further connect with community leaders and other organizations whose goals are interrelated with those of the Freshwater Society. Forming relationships with these other agents may make residents who are less likely to be persuaded more inclined to get on board with the Freshwater Society. A community leader may be someone who holds an official leadership position, for instance who is in charge of a neighborhood e-mail network, or someone without an official position but who is

seen by their neighborhood as an active community member. A community leader is likely social, has a friendly relationship with neighbors, and is involved in organizations like Parent Teacher Associations and/or local social action organizations. Connecting with community leaders may involve recruiting these residents to be Master Water Stewards or, alternately, involve introducing Master Water Stewards to community leaders during outreach and capstone projects. Additionally, partnering with other organizations whose focus is also on water management or lawn alternatives may be helpful in maximizing the Freshwater Society's reach in Minneapolis.

We would like to underscore that these suggestions are based on survey and interview responses from two specific study areas in Minneapolis. Our research provides insights into the human-to-yard relations, barriers to, and diffusion of lawn alternatives at a block level; these processes may work differently at larger scales. We hope that our findings and suggestions prove helpful to the Freshwater Society in working to improve water management in Minneapolis.

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Appendix 1: Survey

A. Getting to know you and your household

Please list your street address _____

1. In what year did you move to this address? _____
 2. Do you own or rent your home? (check one answer) Own Rent

B. Your household's yard

3. Which of the following sources of information do you use in caring for your yard? How useful is each source is?

Source	check if you use this source	Evaluation of usefulness				
		Extremely	Very	Moderately	Slightly	Not at all
My family	<input type="checkbox"/>	5	4	3	2	1
My friends	<input type="checkbox"/>	5	4	3	2	1
My neighbors	<input type="checkbox"/>	5	4	3	2	1
Lawn care company	<input type="checkbox"/>	5	4	3	2	1
Garden/hardware store	<input type="checkbox"/>	5	4	3	2	1
University outreach	<input type="checkbox"/>	5	4	3	2	1
Watershed district	<input type="checkbox"/>	5	4	3	2	1
Master Water Stewards	<input type="checkbox"/>	5	4	3	2	1
Internet resource	<input type="checkbox"/>	5	4	3	2	1
Gardening book	<input type="checkbox"/>	5	4	3	2	1
Other	<input type="checkbox"/>	5	4	3	2	1

4. Which of the following practices are part of your normal yard care routine? (check all that apply)

- Fertilize the lawn
 - Mow the lawn
 - Apply herbicide
 - Remove leaves from the nearest storm drain
 - Rake the boulevard strip
 - Rake the leaves into the street
 - Rake the curbside and gutter
 - Other _____
 - None of the above

5. What features of your yard are most important to you? (*please explain*)

C. Your Surroundings

6. The neighbors on my street think that (*please CIRCLE one number*)

I should not 1 2 3 4 5 I should
 Fertilize my lawn

- Don't know

7. The accompanying photo shows a typical Twin Cities rain garden. What is your reaction to seeing the rain garden? (please write your response)

8. Referring again to the photo, have you seen any gardens like it in your community? Yes No

9. Would you consider installing a rain garden in your yard? Yes No (*please explain*)

10. In the past year, have you contacted or attended an event organized by a

Neighborhood association Yes No

Watershed district Yes No

City or district council environmental or natural resource committee Yes No

Master Gardener/Naturalist Yes No

Master Water Steward Yes No

Other neighborhood group Yes No



Appendix 2: Interview schedule

Personal experiences of the yard/tour of the yard/walking interview

- A. When did you move into this house? What attracted you to this place?
 - What attracted you to the house? Can you elaborate on why you chose this house?
 - Can you elaborate on what attracted you to the neighborhood?

- B. Tell me about how you've made this yard yours.
 - What did the yard look like before moving to this house?
 - What changed?
 - Why did you change it?
 - How do you use your yard? Who all uses or experiences your yard?
 - Do other members of the neighborhood come into this area to utilize the space?
 - What parts are important? And to whom?
 - If there is a difference between front and back yard, inquire about why

- C. Tell me about what practices you use to manage your yard.

- What do you do?
- Why do you use these practices?
- Tell me what happens to your yard when it rains. Where does water go?
- Have your practices changed over the years? If so, how and why?

Information sharing and social influence

- D. How do you make decisions about managing your yard?

- Who is involved in the decision process around your household's yard care practices?
- Who do you share yard tips with? What sort of tips do you like to give?
- What sources of information do you use to inform your decisions? Are there any models or examples that you've tried to follow or apply in your own yard?
- How have friends/family/neighbors influenced you to care for your yard in a particular manner?
- If relevant, have you spoken with other members of your congregation/community about yard care practices? What sorts of information do you share? What have you learned from others? What have others learned from you?

- E. What's next for your yard? What changes do you want to make in the next season or two?

- Why are you interested in making this change?
- What do you think it will take to make the change?
- Who do you think you'll turn to for support?
- Are you aware of the Master Water Stewards program as a resource? (If so, explore how they learned of it and what their perceptions are.)

- F. Have you seen the rain garden at _____ (use picture or otherwise reference the relevant MWS

capstone project)?

- What's your reaction to this garden? What are other people saying about it?
- Would you consider making a similar change in your own yard? Why or why not?
- How do you think your neighbors would react to such a change?

Attitudes and perceptions about different types of yards (photo elicitation)

G. There's a diverse mix of yards in this part of Minneapolis and I'm interested to know your thoughts about some of the different approaches. I'm going to show you a series of photos that depict actual yards in this part of the city. For each picture, I'd like for you to speak briefly about your reactions to it.

For each photo, ask:

What your immediate reaction?

Is it attractive or unattractive?

Would you consider working on your yard to resemble the yard shown in the photograph?

Appendix 3: Photographs used for elicitation

A.



B.



C.



F

D.



E.



G

F.



H

Appendix 4

Characteristics of Resident Interview Participants

Resident (IV)	Has rain garden?	Other yard features	Study area	Family relations	Acknowledges influence of a "community leader"	Attitude/ reasons, enablers or barriers
1	No	n/a	Lake Harriet	Mentioned young kids, older resident	yes, through social network and neighbors	Need of information, concerns of social image, guidance and maintenance help
2	No	Considering vegetable garden	Lake Harriet	Mentioned young kids	yes, across-the-street neighbor	Interested in rain garden but would want help
3	Yes	Vegetable gardens, hosta farm	Lake Harriet	Older resident	Installed rain garden independently but was reached out to by a community leader who shares enthusiasm for their own rain garden.	Considers rain gardens low- maintenance, more interesting and attractive than turf, aligns with environmental stance
4	Yes	Vegetable garden, compost bin	Lake Harriet	Mentioned young kids	Yes	Spurred by neighbor who shared information with the block on grants for rain gardens
5	No	Vegetable garden	Diamond Lake	Younger resident	None identified	Unsure of landlord approval
6	No	No	Diamond Lake	Older resident	None identified	Appreciates the look of wildlife but no other apparent catalyst to spur to rain garden action
7	No	No	Diamond Lake	Mentioned young kids	None identified	Lacks space and aesthetic taste doesn't favor rain gardens
8	No	No	Lake Harriet	Younger resident	None identified	Not aware of rain gardens
9	Yes	Permeable pavers	Diamond Lake	Older resident	None identified	Was convenient to install, meets environmental values
10	No	No	Diamond Lake	Mentioned young kids	None identified	Aesthetic taste doesn't favor rain gardens
11	Yes	Permeable pavers	Diamond Lake	Mentioned Young kids, older resident	Yes	Interest in attractive yard, holds environmental values
12	No	Permeable driveway, rain barrel	Lake Harriet	Mentioned young kids, older resident	No- they were well connected in a network of individuals, but no one community figure	Need for low-maintenance
13	No	Redirected downspouts, rain barrels	Lake Harriet	Mentioned kids	No	Content with existing yard, no interest in changing yard practices
14	No	Vegetable garden	Diamond Lake	Mentioned young kids, younger resident	Yes- neighbor is a master gardener (not MWS)	Need of low-maintenance, maintaining kid play space; would comply if it were required since it is in line with environmental values
15	No	Flower garden, mulch	Diamond Lake	Mentioned young kids, older resident	No	Need information, installation guidance
16	No	Vegetable garden, rain barrel	Diamond Lake	Mentioned young kids	Yes- daughter is a girl scout who had a project with permeable pavers	No time