

Rain Barrels

By Liam Howe, Jared Kannel, Kyra Ngai

Executive Summary

Northfield currently has a rebate in place that will refund households and companies \$20 for installing a rain barrel in their home or business, for up to three installations. By doing this, Northfield hopes to conserve municipal water and decrease stormwater runoff, both issues that are important to Minnesota. In this paper, we will look at additional actions Northfield can take to encourage widespread usage and social acceptance of rain barrels, as well as other individual decisions that can help out with these key issues. We look at the model of recycling, and how the right combination of public information, financial incentives, and group psychology allowed recycling to be as prevalent as it is today. Applying this model to Northfield, we evaluate and determine if the same can be applied for rain barrels.

We have several recommendations for the city of Northfield. First, they should do a better job reaching out about the current rebate program, via email or public postings, to make sure that everyone is aware of the options that are available to them. In addition, having public workshops on rain barrel installation and maintenance, as well as teams of volunteers willing to help install rain barrels for the elderly or disabled, will help ensure that the program is possible for more people. Finally, a clear, well defined goal that Northfield can rally around every year will help instill a sense of local pride and accomplishment and try to get everyone to convince their friends and neighbors to install rain barrels.

I. Introduction

This paper explores the impact of rain barrels in the city of Northfield as well as providing additional suggestions to help further the goals set forth by the current Rain Barrel Rebate Program in Northfield. The primary use of rain barrels is to collect rainwater from household roofs and repurpose the collected water for outdoor purposes, such as watering gardens and lawns. Rain barrels provide a number of benefits to a community, specifically helping improve water conservation efforts by reducing total water usage and decreasing stormwater runoff. As Northfield's water supply from the Jordan Aquifer continues to deplete, efforts to help conserve fresh water will become increasingly critical to maintaining standards of life. Additionally, as stormwater runoff is one of the leading causes of water pollution, reducing runoff is essential for maintaining fresh water quality and preserving aquatic ecosystems.

Though Northfield currently has a rebate program in place to help incentivize residents to install rain barrels on its property, it is not widespread enough to make a significant impact on efforts to both conserve water and reduce stormwater runoff. The rest of this paper will propose possible suggestions for improving the program in place to maximize the effectiveness of rain barrels throughout Northfield. Rain barrels are a relatively cheap means of promoting water conservation and require little to no city maintenance as they are privately owned and operated. As this is the case, it is imperative that rain barrels become as widespread as possible if the program is to reach its peak level of effectiveness. Naturally, the question now becomes how best to achieve this increased level of community awareness and support for the program.

When considering the potential means of widespread growth in rain barrels, it is helpful to observe tactics taken by a similar means of conservation in past years: recycling. Today, recycling in United States has become a social norm and expected from individuals. However, it

did not initially begin this way. In order to combat the increasing levels of litter and waste in the 1970's, both government and private organizations began increasing community awareness for recycling through intensive advertising such as the "Keep America Beautiful" campaign.¹ Between both the intensive awareness campaigns and rebate programs such as deposit-refund systems for beverage containers, recycling has more than tripled since 1980 to its current rate of 34 percent of all recyclable materials being recycled.²

It is with this story in mind that we provide suggestions for helping improve and expand rain barrel usage throughout Northfield. This paper suggests that through extensive advertising and better informing of the Northfield public, rain barrel usage can increase to the point at which it becomes a social norm throughout Northfield. It cannot become a widely accepted social norm without widely available, easily accessible information on how to make it work. As Michael Vandenberg and Paul Stern argue, "Research has shown that providing information about common behaviors within a population can motivate individuals to model that behavior, reflecting how societal influence can affect personal actions."³ Rather, the changing societal norms can greatly alter the behavior of individuals within the population, causing widespread support for a certain behavior. Specific to Northfield, reaching this goal of widespread rain barrel usage needs to begin with more aggressive advertising strategies and rain barrel information available to the public. This includes, but is not limited to, public events where residents can come purchase their rain barrels as well as receive demonstrations as to how to properly install, use, and maintain their barrels all in one location. Northfield should also

¹ Waxman, Olivia B. "America Recycles Day 2016: A Brief History of Recycling." Time. November 15, 2016. <http://time.com/4568234/history-origins-recycling/>.

² "America Recycles Day 2017." EPA. November 16, 2017. <https://www.epa.gov/recycle/america-recycles-day-2017>.

³ Vandenberg, Michael P. and Stern, Paul C., The Role of Individual and Household Behavior in Decarbonization. November 1, 2017. 47 Environmental Law Reporter; Vanderbilt Law Research Paper No. 17-52.

continue to offer a rebate for properly installed rain barrels because this provides a monetary incentive to help encourage proper installation and maintenance. While this is likely to be a long-term goal, increased rain barrel usage throughout Northfield can help encourage Northfield to begin movements toward greater overall levels of sustainability.

This paper will begin with a discussion of the mostly environmental and economic problems in Northfield that rain barrels could hope to solve. This section begins with an evaluation of Northfield's water usage and how the reduction in municipal water usage afforded by rain barrels will benefit local water conservation and concludes with a description of the economic and environmental damages due to stormwater runoff. From there, we briefly touch on the details of the rain barrel, before making our recommendations for Northfield to increase public outreach, offer resources for installation and maintenance, and clearly define a goal for the community to rally around.

II. What Problems Do Rain Barrels Address?

Over the past decade, the rise in rain barrel programs throughout Minnesota has grown steeply. Naturally, this may beg the question of why we bother installing such programs and infrastructure. This inquiry can be answered by looking at two major environmental issues that face the United States currently: fresh water scarcity and stormwater runoff pollution. Both of these dilemmas pose significant threats to Northfield's sustainability not only in the short-term, but also for future generations. By implementing and promoting a widespread rain barrel program in Northfield, the city attempts to address both of these growing problems by conserving water used for household gardening and limiting the amount of runoff flowing into the waterways.

Water scarcity is a growing issue that affects hundreds of millions of people around the globe. However, not many people realize that water scarcity is also a very real threat in Minnesota. While Minnesota obtained its water almost entirely from surface water in 1940, this trend has reversed over the past century as Minnesota now currently uses roughly 75% groundwater compared to 25% surface water.⁴ Remaining consistent with this trend, Northfield currently draws all of its water household from the Jordan Aquifer. However, this has become an issue as water is being drawn out of the aquifers faster than it can be replenished. As population and development continues to grow, Minnesota is at risk of running out of groundwater in the future. By increasing rain barrel usage, Northfield can help limit the amount of water used for watering tasks and help conserve water for future generations.

According to the city of Bloomington, MN, up to 40% of summer water is used for household watering⁵. Northfield households can help decrease their water demands by utilizing rain barrels for watering purposes. Not only does this help conserve water, but rain water is actually better for watering yards and plants.⁶ This is due to the water purifying techniques of Northfield which entails adding more chlorine to kill any microorganisms in the water and making it fit for drinking purposes. While this improves the water quality for human consumption, the hard, chlorinated groundwater may in fact be damaging to plants and actually kills many beneficial and symbiotic microorganisms⁷. Microbes known as endophytes have been shown to help plants grow faster and survive in more hostile conditions, however chlorine can

⁴ "The Threats to Minnesota's Groundwater." Minnesota Pollution Control Agency. October 03, 2017. <https://www.pca.state.mn.us/water/threats-minnesotas-groundwater>.

⁵ "Rain Barrels More Than A Drop In The Bucket For Conservation More Than A Drop In The Bucket For Conservation". <https://www.bloomingtonmn.gov/sites/default/files/rain-barrel-info.pdf>.

⁶ "Rain Barrel Rebate". 2018. *Ci.Northfield.Mn.Us*.

https://www.ci.northfield.mn.us/DocumentCenter/View/272/Rain_Barrel_Rebate_Brochure.

⁷ Kinney, George. "Personal Communication via Email" 13 Apr. 2018.

kill these beneficial microbes off⁸. In addition to limiting household water usage, rain barrels can also benefit Northfield reducing stormwater runoff.

Stormwater runoff is the result of rainwater running off solid surfaces and collecting harmful bacteria and pollutants, ultimately depositing them in our waterways. These chemicals and pollutants can contaminate rivers and waterways, potentially having severe impacts on marine life as well as increasing swimming and boating prohibitions. Not only does stormwater runoff cause increased water pollution, but runoff can increase flooding and streambank erosion, causing significant economic and environmental damage as a result.⁹

In regard to how this affects Northfield specifically, much of the stormwater runoff drains into either the storm sewers or the Cannon River. This excess water can cause the banks of the Cannon River to erode and potentially lead to significant flooding, shutting down public roadways and businesses. According to the US Geological Survey, the annual precipitation runoff in Northfield into the Cannon River has been growing at an average rate of 9.6% per year from 2013-2017¹⁰. Rain barrels, while probably not voluminous enough to stop a major flood, can do their part to slightly curtail the immense volume of stormwater flowing into both the Cannon River and storm sewers following heavy rains often experienced in the summer months in Minnesota. This not only limits the chances of damaging floods and further riverbank erosion, but also preserves water purity by limiting pollution in Northfield's waterways.

While rain barrels are not a complete solution to the problems caused by storm runoff, they are a passive means of limiting runoff throughout Northfield. Additionally, as they are

⁸ Khan, Zareen, Hyungmin Rho, Andrea Firrincieli, Shang Han Hung, Virginia Luna, Oscar Masciarelli, Soo-Hyung Kim, and Sharon L. Doty. "Growth Enhancement and Drought Tolerance of Hybrid Poplar upon Inoculation with Endophyte Consortia." *Current Plant Biology* 6 (2016): 38-47.

⁹ "Sources And Solutions: Stormwater | US EPA". 2018. *US EPA*.

<https://www.epa.gov/nutrientpollution/sources-and-solutions-stormwater>.

¹⁰ "USGS Current Conditions For USGS 05355024 CANNON RIVER AT NORTHFIELD MN". 2018. *Waterdata. Usgs.Gov*. https://waterdata.usgs.gov/nwis/uv?site_no=05355024.

privately owned and operated, they require no city maintenance in order to function. To achieve the greatest impact, the rain barrel initiative program will have to see increased growth as it is more widely adopted by the households of Northfield. More specifically, a typical rainstorm of 0.25 inches creates 45 gallons of roof runoff per 300 square feet of roofing. If all 6,361 households¹¹ throughout Northfield incorporated a rain barrel of at least 45 gallons, this would save the city 286,245 gallons of water per 0.25 inches of rain¹². As Northfield has experienced an average annual rainfall of 27.8 inches from 2015-2017, this translates roughly to 31,830,444 gallons of rainfall saved per year solely in Northfield¹³. This is only 0.76% of the 4.15 billion gallons of rainfall in Northfield annually¹⁴, yet it would help save Northfield roughly \$50,210 in water utilities as well as limiting the amount of water being drawn from the aquifer¹⁵. Though this is an idealistic prediction as it assumes full participation and full barrel usage between rains, it presents the possible effect that rain barrels in Northfield alone could have on both water conservation and limiting stormwater runoff. The impact on total water conservation could be significantly higher if rain barrels were more commonly utilized throughout the entire United States.

III. What Northfield Is Already Doing on the Topic

A. Summary of Actions

Fortunately, Northfield already has a program in place to incentivize the purchase, installment, and use of rainwater collectors. With a purchase of a rain barrel, as well as proof of

¹¹ "U.S. Census Bureau QuickFacts: Northfield City, Minnesota." U.S. Census Bureau. 2018. <https://www.census.gov/quickfacts/fact/table/northfieldcityminnesota/PST045216>.

¹² "Rain Barrels More Than A Drop In The Bucket For Conservation More Than A Drop In The Bucket For Conservation". <https://www.bloomingtonmn.gov/sites/default/files/rain-barrel-info.pdf>.

¹³ "Yearly Summary". Carleton College Weather Database. 2018.

<http://weather.carleton.edu/summary.php?year1=2018&month=4&year2=2017#top>.

¹⁴ Ibid.

¹⁵ "Utility Rates | Northfield, MN - Official Website." City of Northfield. <https://www.ci.northfield.mn.us/524/Utility-Rates>.

correct installment and use, Northfield will provide residents with a one-time rebate of \$20 to help offset the upfront cost, which usually ranges from \$40-\$200. Requirements for receiving the rebate include a minimum barrel size of 40 gallons, Northfield will only refund a maximum of three rain barrels per household or firm. In their description of the rebate, the city of Northfield cites water conservation, reduction of stormwater runoff, and increased benefit of rainwater on garden plants as additional benefits of collecting rainwater.

B. Plans for the Future

There are no current expansion plans in Northfield at the moment, but there is room to make this policy more effective in making sure rain barrels get used continuously throughout town, as well as possible additional programs to further water conservation efforts in the city.

IV. Our Recommendations for Increasing Rain Barrel Usage in Northfield

Based on our research, we think there are several things Northfield could do, in addition to the current rebate, in order to try to increase the prevalence of rain barrels within the city. All of these recommendations are based on trying to ease decision making process and sell everyone on installing rain barrels and changing citywide behaviors without too much cognitive strain on Northfield residents. We recommend Northfield market the rebate more aggressively through platforms such as social media and email, hold public and well-advertised workshops in town about the benefits, maintenance, and use of rain barrels, employ teams of volunteers to help install rain barrels for those who can't and don't want to, and create a clearly defined, well-advertised goal that the town can rally around.

A. Ordinances and Policies Employed by Other Municipalities

Like most states in the US, Minnesota has no laws or restrictions against the installment of rain barrels and few for harvesting or using rainwater, be it for domestic or industrial

purposes. Individuals and businesses alike have no limits to how much rain they are permitted to collect as long as they do not withdraw more than 10,000 gallons of water per day or 1 million gallons per year, for which they'd need a permit¹⁶. Furthermore, standard rain barrel sizes do not exist and the usage of any type of barrel is allowed, allowing owners the flexibility of choosing a suitably sized barrel(s) to fulfill their water needs.

Rain barrels are generally supported in most municipalities; cities in Minnesota acknowledge the benefits of rain barrels and encourage their residents to purchase them, citing the advantages that rain barrels can provide households as well as emphasizing their easy application and low cost through online advocacy and rain barrel events. Websites provide online order forms for residents of nearly all municipalities within the state. In addition, other important information, such as instructions for usage and maintenance, can be found online. Aside from that, they allow for easy access to information about rain barrel maintenance and the potential dangers of improper rain barrel use, which could result in issues like mosquito breeding and algae growth¹⁷. Some areas go further to promote rain barrels by offering residents a grant¹⁸ to buy rain barrels while other cities have extended rebates to owners.

Many cities collaborate with other cities or organizations, such as the Recycling Association of Minnesota (RAM), which manages rain barrel programs and workshops, allowing residents to purchase or learn more about ways to harvest rainwater for future use. The majority of organizations offer incentives to residents to purchase rain barrels; for example, the RAM

¹⁶ "Water Use Permits - Water Appropriations Permit Program | Minnesota Department of Natural Resources." Buckthorn: What You Can Do! - Invasive Species | Minnesota Department of Natural Resources. Accessed May 08, 2018.

https://www.dnr.state.mn.us/waters/watermgmt_section/appropriations/permits.html

¹⁷ Meeker, Nicole Garner. "Keep Your Rain Barrel Algae and Bug-Free This Summer." *Dave's Garden*, July 12, 2017. Accessed May 22, 2018. <https://davesgarden.com/guides/articles/keep-your-rain-barrel-algae-and-bug-free-this-summer>.

¹⁸ "Rain Barrels." Night to Unite | White Bear Lake Minnesota. Accessed May 01, 2018. <https://www.whitebearlake.org/ee/page/rain-barrels>.

partners with local governments and watershed districts to provide rain barrels at much lower prices, as well as organizes locations where citizens can pick up their rain barrels and workers who can install them if the owner does not want to do it themselves¹⁹.

Aside from these current actions, other measures to encourage an increase in rain barrel usage have been employed by local and statewide governments in the past. These actions include holding multi-media campaigns, frequent monitoring of rain barrel usage²⁰, and large-scale rain barrel sales, all of which have had varying impacts on citizens' attitude and knowledge of rain barrels as well as broader environmental issues.

B. Effectiveness of Policies

These policies have had varying degrees of effectiveness depending on the nature of the policy and how they were put into action. In general, policies that increased public awareness for rain barrels were more effective at gaining citizens' interest in investing in rain barrels compared to other policies. Effectiveness can be measured by evaluating how many and how quickly people responded to rain barrel programs, as well as how much programs cost and the time it takes to implement them. Considering these factors will be key to determining the effectiveness of policies and whether or not it is worth it for Northfield to follow suit and upscale its rain barrel program.

Firstly, municipalities that focus on public outreach for rain barrels tend to run more effective programs as more people are aware of them and know how to order, implement, and maintain them. Contacting people directly through email seems to be a particularly effective and

¹⁹ "About Us." Recycling Association of Minnesota. 2017. Accessed April 27, 2018.
<http://recycleminnesota.org/work/compost-bins-rain-barrels/>

²⁰ "Request for City Council Committee Action from the Department of Regulatory Services." November 21, 2016. Accessed May 4, 2018.
http://www.minneapolismn.gov/www/groups/public/@council/documents/webcontent/convert_285127.pdf.

widely used strategy by several municipalities. In 2017, a rain barrel program was executed in the City of Shoreview, MN, beginning with an email sent out to 1,600 residents along with a link to the RAM rain barrel ordering page. Within 48 hours, 98 rain barrels had been sold to 72 customers²¹ which suggests that increasing awareness of rain barrel programs through online platforms quickens response time towards these programs compared to simply waiting for people to find and order from the online order form. However, this does not necessarily attract more people to it. However, utilizing email lists is also a more efficient outreach strategy because it is a cheaper and quicker way of conveying information to larger audiences. This is supported by proposals for a multi-media campaign on rain barrels from the City of Minneapolis in 2006 that also included email lists as a way to inform their residents.²²

In some cases, promoting rain barrels can also lead owners to consider implementing other stormwater conservation measures or encourage other municipalities to adopt those programs, as exemplified by several successful rain barrel programs across different cities. In Northern Virginia and New Jersey, a study which ran from 2008-2011 showed that people who took part in rain barrel programs not only became more educated about rain barrels and stormwater conservation, but also considered partaking in other water conservation practices. A follow up survey from the rain barrel program indicated that 58% of participants from New Jersey and 48% of participants from Northern Virginia took further actions to conserve stormwater after installing a rain barrel. Conservation actions included but were not limited to the implementation of rain gardens and cisterns, reducing lawns, and adding mulch to gardens.

²¹ Passi, Sage. "100 Rain Barrels in 48 Hours." Ramsey-Washington Metro Watershed District. November 20, 2017. Accessed May 03, 2018. <https://www.rwmwd.org/100-rain-barrels-in-48-hours/>.

²² "Request for City Council Committee Action from the Department of Regulatory Services." November 21, 2016. Accessed May 4, 2018. http://www.minneapolismn.gov/www/groups/public/@council/documents/webcontent/convert_285127.pdf.

Similarly, in Shoreview, MN, rain barrel owners stated an interest in going further by adding a rain garden to their households and also reported an increasing interest from their neighbors about getting rain barrels.²³ As stated before, having effective outreach policies has also encouraged other municipalities to adopt similar programs and practices. One example is Northfield itself, which adopted its rain barrel program following numerous programs in the metro area.²⁴

It is less clear how effective financial subsidies are. Some municipalities in Minnesota, such as Northfield and Rochester, offer rebate programs, while other places offer grants including the Rice Creek Watershed District or Vadnais Lake Area Water Management Organization. Organizations like RAM also sell barrels for lower than retail prices. However, studies and an interview have suggested that while these programs are available, they might be less effective at attracting potential owners than public outreach. When asked, the Environmental Quality Commissioner of Northfield stated that while the number of people using rain barrels has increased over the years, people have done so without even knowing about the city program and any financial programs attached to it²⁵. Likewise, in Shoreview a survey revealed that ¾ of people who purchased rain barrels through the city program were not aware of the cost-share program that came with it.²⁶ In other words, this might imply that outreach on rain barrel benefits are effective enough that people want to buy them even without financial incentives.

C. Our Recommendations

1. Outreach

²³ Passi, Sage. "100 Rain Barrels in 48 Hours." Ramsey-Washington Metro Watershed District. November 20, 2017. Accessed May 03, 2018. <https://www.rwmwd.org/100-rain-barrels-in-48-hours/>.

²⁴ Kinney, George. "Northfield Rain Barrel Program Interview." E-mail interview by author. April 16, 2018.

²⁵ Kinney, George.

²⁶ Passi, Sage. "100 Rain Barrels in 48 Hours." Ramsey-Washington Metro Watershed District. November 20, 2017. Accessed May 03, 2018. <https://www.rwmwd.org/100-rain-barrels-in-48-hours/>.

Northfield should take a more aggressive, targeted marketing approach to getting more residents to install rain barrels. Right now, the information about the rebate is available online, but will only be found by people who are specifically looking for it. There is every reason to believe that an email campaign similar to what worked in Shoreview will work in Northfield as well. Intensive awareness campaigns were largely responsible for making recycling widespread in the 1980s and 90s²⁷. Northfield should employ similar techniques in order to make rain barrels the next big behavioral shift. In addition to email, Northfield could advertise in local papers, encourage businesses to post information about it in their establishments, and make use of social media. Any time Northfield sees an opportunity to get a pair of eyes looking at the rain barrel rebate information, it should make the choice to do so.

An increased focus on marketing through email and social media will start benefiting the town of Northfield almost immediately. Email marketing has been shown to work in Shoreview, so this campaign will almost definitely increase rain barrel sales. In addition, this recommendation costs very little money, so there are hardly any economic costs. If the email and social media campaigns are as successful as they should be, the rain barrel rebate will be common knowledge to all well-informed Northfield citizens, and we can hope that they will continue to spread knowledge about the program through word of mouth and social organizations.

There are not a lot of issues to think about when considering this first recommendation. There are no material input costs, and hardly any labor costs. Finding someone to write the email should not be especially difficult. The only issue could be convincing businesses to help promote the program. We could hope that businesses could identify their customers as being very

²⁷ Waxman, Olivia B. "America Recycles Day 2016: A Brief History of Recycling." Time. November 15, 2016. <http://time.com/4568234/history-origins-recycling/>.

civically minded and responding positively towards their efforts to promote sustainability in Northfield and willingly agree to help out, but it wouldn't be an especially big deal if they declined to contribute. Besides that, there are hardly any program design issues for this recommendation. The only costs in our recommendation are advertising, which in Northfield, is about \$14 per ad²⁸. Writing and sending a good email takes an hour at best, and if enough people who care about water conservation are found, posters, ads, and other informative materials could be put up in downtown Northfield in a single day.

2. Public Events

Aside from outreach, Northfield should also hold more public events related to rain barrels including workshops and large rain barrel sales to effectively increase participation in its rain barrel program. Previously Northfield had obtained its rain barrels from the workshops held by the Cannon River Watership Partnership several years ago²⁹; we recommend that Northfield make efforts to not only keep collaborating with other municipalities but follow their example and offer workshops to its residents. Workshops are beneficial as they instill confidence in potential rain barrel buyers by giving them options to learn how to install and maintain a rain barrel. For example, the workshops could include live demonstrations that show people how to operate a rain barrel, such as how to attach it to a gutter or what to use to prevent insects from entering the barrel and contaminating the water. Demonstrations make it easier for potential buyers to visualize themselves handling a rain barrel which could help convince them to purchase it. There are also other advantages, which include showing residents that water conservation efforts don't have to be overly complicated or expensive, that simple measures taken by individuals can be effective as well if everyone makes the effort to try.

²⁸ "Cost of Newspaper Advertising in Northfield, MN." Gaebler.com. <http://www.gaebler.com/Cost-of-Newspaper-Advertising-In-Northfield---MN>.

²⁹ Kinney, George. "Draft Carleton Sustainability Papers." E-mail. May 15, 2018.

Similarly, Northfield should consider holding large rain barrel sales in several central locations within the city to increase its program's publicity. Holding public sales with the help of organizations such as the RAM is a strategy that has been employed in several counties such as Olmsted County³⁰ and Dakota County³¹. It garners an enthusiastic response from participants who are familiar with rain barrels and their advantages³². Therefore, it could be in Northfield's interest to hold large sales in busy, public areas because they may attract new people to the program if people can observe a positive and satisfied attitude from those who are familiar with rain barrels. Moreover, because sales in central areas have a large presence they are an effective way of increasing other people's knowledge of the rain barrel program; even if they are not interested in it, making them aware of the program could lead to later interest or more people learning about it through word of mouth.

In addition to being a means of increasing water conservation efforts which is beneficial to Northfield's natural environment, there are multiple advantages from promoting rain barrels through public events such as these. Because workshops and public sales bring more attention to rain barrels, it helps increase the number of people investing in rain barrels and using stormwater. This is economically beneficial for Northfield as it decreases the amount of water that must undergo expensive and energy-intensive sewage treatments³³. As well as that, after demonstrations fewer people will feel the need to pay someone to install their rain barrel as they've seen how it is installed and can do it themselves, allowing them to save some money. It

³⁰<https://www.co.olmsted.mn.us/environmentalresources/garbagerecycling/compostsite/compostbinandrainbarrelsale/Pages/default.aspx>

³¹https://www.hometownsource.com/sun_thisweek/community/dakota_county/discount-compost-bins-rain-barrels-available/article_4b915a2c-3f55-11e8-a356-0bcc079e8478.html

³² "Local Residents Stampede Fairgrounds during Rain Barrel and Tree Sale." LillieNews. April 15, 2018. Accessed May 23, 2018. <http://www.lillienews.com/articles/2015/03/12/local-residents-stampede-fairgrounds-during-rain-barrel-and-tree-sale>.

³³ "Top 10 Benefits of Rain Barrels." Epoch Rain Barrels. April 22, 2013. Accessed May 27, 2018. <http://epochrainbarrels.com/top-10-benefits-of-rain-barrels/>.

also decreases air pollution as having several large trucks deliver all the rain barrels to Northfield also ensures that individual buyers will not have to drive far to get one or two rain barrels, especially if they drive farther than necessary to get one. With regard to social benefits, these public events are interactive ways for Northfield's residents to get involved with protecting their environment. Being able to learn about rain barrels through a hands-on approach rather than just reading about it allows people to get a sense for how they can contribute on the individual level to help their community as well as building up an ethos based on sustainability.

Before deciding on implementing this recommendation, there are some limitations to it that Northfield should address. Firstly, it takes time and money to run and advertise public events, otherwise there will not be very large turnouts and the event cannot be as effective. External factors such as extreme weather events might impede public events from happening or discourage people from going to them, so Northfield might have to consider measures to mitigate those effects such as holding some events inside. Minnesota also experiences very extreme winters and summers, so Northfield should analyze when in the year most people are willing or able to leave their homes aside from going to work and school.

3. Volunteers

To supplement public events, we recommend that Northfield start a volunteer program where volunteers can collaborate with workshops or sales and go to buyers' houses to help them install their rain barrels for them. Because not everyone has the time, knowledge or confidence to install a rain barrel on their own, having a volunteer do it for them ensures that these people can still participate in the rain barrel program. Having a volunteer program also acts as an incentive for people who are interested in rain barrels but are simply not bothered to install them, or elderly people who lack the physical capabilities to move and install a rain barrel which may be

an issue considering Northfield's large aging population. The presence of two colleges and a school in Northfield make implementing a volunteer program a viable solution to increasing participation, as there are plenty of students from these educational institutions that could act as volunteers as a part of a school project or club. For example, Carleton College has several sustainability-oriented clubs and associations³⁴ that can be trained and go to nearby homes on the weekends to help with installation.

Having a volunteer program benefits Northfield's rain barrel program as it incentivizes more people to join it, especially those who wouldn't usually be able to join without the additional help. There are young people from Northfield's educational institutions that can help the local residents, allowing a sense of community to be formed through a common desire to act sustainably. At the same time, volunteers would gain experience and knowledge that they could then apply to other programs or places they encounter in the future, furthering water conservation efforts at the local level. Moreover, an economic benefit of a volunteer program is that it does not cost anything to form it and implement it, as neither the Northfield council or rain barrel buyers would have to pay the volunteers for their work.

Some limitations of a volunteer program that Northfield should take into account is that volunteers need to be adequately trained before they can help. There needs to be a way to ensure that they can properly install rain barrels, as well as know how to approach different houses and gutters because not all of them will be the same. They need to have knowledge of installing different types of rain barrels since some buyers prefer open rain barrels while others prefer

³⁴ Noe, Ryan. "Student Organizations | Sustainability | Carleton College." The Winter of the World/Carleton College. Accessed May 27, 2018.
https://apps.carleton.edu/sustainability/action/involved/carleton_orgs/.

closed ones³⁵, and should also be able to advise rain barrel owners whose houses don't have a gutter system on where the best location to place their rain barrel would be. Other limitations could include a lack of volunteers at any time, whether because they are on school break or have no time to volunteer. However, this could be resolved if the volunteer program was open to everyone in Northfield rather than just those enrolled in college or school because while they are the most likely to volunteer, students are not necessarily available at all times.

4. Establish a Goal

When trying to rally a town into making a good decision for the community and the local environment, it helps to have a clearly defined goal. There has been a considerable amount of psychologically based performance research on goal setting in a work-based environment, pioneered by the psychologist E.A. Locke. Locke, and many of his successors in the field of goal theory, created studies and experiments that all confirmed the fact that setting goals is likely to increase productivity and effectiveness³⁶. This main claim is further broken down into two hypotheses. Locke's first hypothesis is that hard and challenging goals will result in higher levels of performance compared to easier goals. The second hypothesis states that clear and specific goals lead to better performance than goals worded ambiguously. James Quick, in his brief review of goal theory, cites 17 different studies whose conclusions all confirm these two hypothesis, but with one major caveat. Goal setting is only effective if they are accepted by the people for whom the goals were set³⁷.

³⁵ "Choosing a Rain Barrel." Sosplantcare.com. Accessed May 25, 2018. <http://sosplantcare.com/how-to-choose-a-rain-barrel/>.

³⁶ Quick, James C. "Dyadic Goal Setting within Organizations: Role-Making and Motivational Considerations." *The Academy of Management Review* 4, no. 3 (1979): 369-80. <http://www.jstor.org/stable/257193>.

³⁷ Ibid.

The town of Northfield is not a workplace environment, but we can apply some of the principles of goal theory to both confirm that setting a goal will be effective in increasing local rain barrel usage and to determine what that goal should be. While the dynamics between a local government and its residents differ significantly between that of a boss and the employees, in an ideal setting, both groups of people are trying to work together towards the same end. In the case of Northfield, a rain barrel goal that everyone agrees upon will motivate residents to buy more rain barrels, take advantage of the rebate, and try to convince their friends, neighbors, and colleagues to do the same.

Northfield should consider Locke's two hypotheses when figuring out what the goal should be. Based on the first hypothesis, Northfield should make the goal something challenging, but not impossible. To do this, they will need data on how many people have already bought rain barrels, as well as the total potential numbers of rain barrels that could be installed. They should choose a discrete, specific number of rain barrels they hope to install so as to satisfy the second hypothesis. Rather than, "install more rain barrels," which is both easy and vague, Northfield should define their goal to be something like "install 1000 new rain barrels every year," which is both difficult and specific. Once a goal is decided, Northfield should publicize the goal as well as the progress the residents make towards the goal every year.

Establishing and publicizing a goal could lead to some potential difficulties in policy implementation. First, when trying to figure out how high the goal should be, it will be difficult to find the right data, including the total number of rain barrels that have already been installed and the potential number of rain barrels that could be installed. Surveys could be inaccurate, and it would be inefficient to send people to count possible rain barrel locations at all of the houses and businesses in Northfield. The second potential implementation problem is figuring out how

to get the citizens of Northfield to agree on the goal. People who already have rain barrels are more likely to agree on a rain barrel goal than people who have not gotten or refuse to get rain barrels. This could be solved by having an open town meeting to finalize the goal, but there is no guarantee that any significant percentage will show up to the meeting, rather than the entire town of Northfield agreeing to the goal, it could just be the more civic minded residents who have time to go to town meetings deciding for everyone else.

VI. Conclusion

The implementation of a rain barrel program in Northfield was a positive step towards a more sustainable future. However, usage on a larger scale will be crucial towards maximizing the benefits from the program. Each rain barrel installed in Northfield helps limit both the amount of excess water used for irrigation purposes as well as the amount of stormwater runoff flowing into Northfield's waterways. By implementing a variety of financial, information based, and behavioral strategies to normalize the use of rain barrels, Northfield can take important steps in fixing two prominent water issues and establish itself as a leader for other municipalities to follow. As rain barrel usage becomes the social norm in Northfield, it will pave the way for the city to become more proactive in stormwater conservation by implementing other conservation measures.