# The Nine Mile Run Watershed Association Rain Barrel Program:

# An Analysis of Use and Efficacy

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Revised Report

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## Executive Summary

During the summer of 2006 the Nine Mile Run Watershed Association (NMRWA) conducted a two-stage survey in order to assess the status and usage of 496 rain barrels installed throughout the Nine Mile Run watershed during the summer of 2004. The purpose of this study was to identify and address maintenance problems, to assess realized program benefits and to generate useful suggestions for the future of the rain barrel initiative. The first stage of this study consisted of a brief questionnaire which sought basic information and was mailed to all rain barrel owners. The second stage of this study engaged a representative segment of rain barrel owners in an evaluative discussion of the project. Taken together, these two phases provided a broad analysis of the rain barrel initiative to date.

The results of these analyses indicate that while most rain barrel owners are generally satisfied with their barrels, many owners do not perform basic maintenance tasks or drain their barrels regularly. Furthermore, although rain barrel ownership clearly provided opportunities for learning about watershed issues, the data presented here fail to provide a clear indication of the program's success in realizing this potential. Considering these findings, design and installation modifications that reduce the maintenance and drainage responsibilities of owners will be necessary for technical

success, while a more extensive outreach campaign may be necessary to measurably increase involvement in water quality issues.

## Introduction

The rain barrel initiative was born out of the need to begin addressing serious regional storm water issues while exploring new technologies and engaging watershed residents in visible solutions to local problems. The combined sewage system of the City of Pittsburgh coupled with illegal connections to sanitary systems in Edgewood, Swissvale and Wilkinsburg meant that historically, as little as a quarter of an inch of rain could overwhelm the system and send torrents of untreated sewage into Nine Mile Run. The fact that the costly upgrades necessary to fully remedy this problem involve many years of planning, fund-raising and construction, made Nine Mile Run an excellent location to test alternative solutions to storm water management.

Lot-level rain barrel installations emerged as a promising opportunity, and after conducting engineering analyses, the NMRWA secured funding to purchase and install 500 rain barrels on residential downspouts throughout the watershed. The installations were primarily completed within the summer of 2004 by a team of interns hired through the Student Conservation Association. Prospective participants were recruited by mailings and door-to-door canvassing conducted by the interns (see Appendix A). Both the barrel and its installation were free for participants in the program.

Before this primary phase of installations, additional participants were recruited through classes conducted by NMRWA. Forty-five participants paid $65 and received a barrel as well as training to install and properly use the barrel. There were also a limited number of barrels which were returned to NMRWA because the owner no longer wished to participate in the program. In order to fairly redistribute these barrels, NMRWA consulted a waiting list of over 50 interested residents that were not served during the initial phase of installations. NMRWA distributed and installed barrels to those who had been waiting the longest. This process of redistribution has been ongoing since the summer of 2004.

Engineering studies of the area suggest that 3500 additional barrels will be necessary to create measurable impacts on storm water quality and quantity, reducing total storm flow by 11% and combined sewage overflows by 4%. Economic analyses suggest that at this level of participation, the rain barrel program would cost between 27% and 60% of what a centralized storage system of similar capacity would cost to build. However, this optimistic estimate depends on ideal behavior among participants, an assumption this study aims to test. The results of this study will also be used to optimize the design of future rain barrels and to inform future program planning.

Prior to this study, a follow-up survey was conducted by mail in February of 2005, with 273 responses (see Appendix B). Excluding this mailing, all contact with rain barrel owners following the installations was problem specific and user initiated. Considering the limited contact between NMRWA and rain barrel owners, this study not only sought to collect data on the usage and efficacy of rain barrels in the field, but also

to repair damaged barrels, relocate unused barrels, welcome new rain barrel owners into the program and gently remind owners of proper usage.

## Methods

The first stage of the study consisted of an eight item questionnaire (see Appendix C) that was mailed to all of the 496 rain barrel owners that were officially recorded in the NMRWA database. In addition to the questionnaire, a letter (see Appendix D) was included, explaining the scope and purpose of the project. Open-ended comments made by respondents were scored as positive, neutral or negative, depending on a subjective interpretation of the respondents comments.

After allowing three weeks for rain barrel owners to return questionnaires, non-responsive owners were called and a message requesting a response was left when possible. Due to low yields, this technique was replaced by selective canvassing after forty calls were made. Canvass routes targeted neighborhoods with high rain barrel densities in order to maximize efficiency. Each stop along the route began with an intern surveying the property for the location and condition of the rain barrel. If the barrel was not located, the intern then attempted to contact the owner in order to determine the status of the rain barrel. Typical encounters were congenial and brief. Maintenance was

performed when necessary and photographs of the rain barrels (see Appendix E) were taken when possible. When visible, the configuration of the spigot was also recorded.

Personal interviews were generally thirty to forty-five minutes and included twenty-three directed short answer questions as well as three opportunities for open ended comment (see Appendix F). Fifty personal interview candidates were selected from the total pool of rain barrel owners using a random sample stratified by municipality. Eighteen candidates were selected from the City of Pittsburgh, fourteen from Swissvale, twelve from Edgewood, five from Wilkinsburg and one from Penn Hills. All candidates were called two weeks after the introductory letter was mailed. Of these, five had inactive or incorrect phone numbers, twenty one did not respond, three no longer owned a barrel and twenty one participated in the program (see Appendix G).

Interviews were conducted on the subject's property when possible, although two of the twenty-one subjects were unable to schedule a personal meeting and completed the interview over the phone. A maintenance check (see appendix H) was included in the interview in order to encourage participation and to provide an opportunity for direct observation of the condition of the rain barrels. The interview itself could be completed in as little as fifteen minutes, although few ended in less than thirty minutes. The maintenance check lasted about five minutes unless maintenance was required. When missing, mesh socks were retrieved from the interior of barrels and reattached. All mesh sock attachments were reinforced with a one-inch screw. Further maintenance tasks varied but included leveling the installation site, redirecting the overflow and reconnecting the downspout to the barrel. In addition to the personal interview and the

maintenance check, subjects were asked to complete an anonymous four-item demographic questionnaire (see Appendix I).

## Key Findings

Here the most significant results of the study are presented, focusing specifically on user satisfaction, owner interaction with the barrel and citizen engagement. These areas of focus were selected because of their relevance to future programming for NMRWA. These findings draw on data from the status update questionnaire, personal interview, maintenance check and demographic questionnaire (see Appendices J, K, L and M respectively).

### Satisfaction

Several indications across both surveys suggest that most rain barrel owners are satisfied with their participation in the program. As Figure 1 indicates, the majority of comments on the status update questionnaire were on the whole positive. Furthermore, of the responses that were scored as negative, most criticism was narrow and focused on a specific grievance rather than on the program as a whole. All twenty-one participants

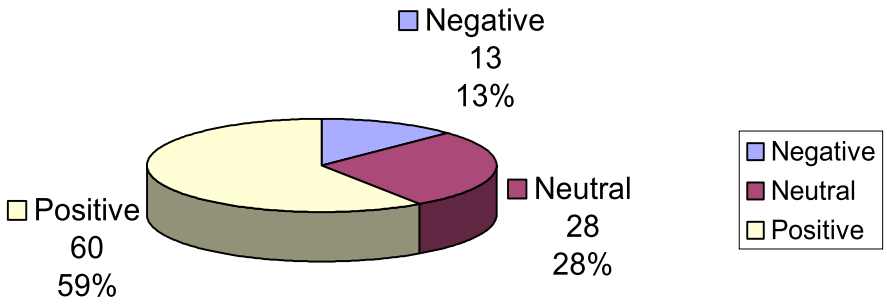



**Figure 1**: Disposition of comments provided on returned mailing surveys

in the personal interview were satisfied enough with the overall program that they would recommend the barrel to a friend. This is consistent with the finding of the 2005 follow-up survey that 95% of rain barrel owners would recommend the barrel to a friend, suggesting that satisfaction has remained robust over time. During the personal interview, users indicated that they would be willing to pay an average of $53 in order to participate in the program. This is also comparable to the results of the 2005 follow-up survey.

Maintenance and Use

While rain barrel owners may be generally pleased with the performance of NMRWA and the RiverSafe rain barrel, the use and maintenance data suggest that many owners are negligent in draining and caring for their barrels. Although the frequency with which owners fully drain their barrels varies dramatically, on average owners drain their barrels less than once every three rains. Fortunately, two thirds of personal interview subjects have their overflow routed onto a permeable surface. This configuration partially offsets owner negligence by providing overflowing water with the

opportunity to infiltrate into the soil. Nonetheless, a complete lack of use by some owners renders the barrel all but useless as water simply flows through the bypass. This pattern of non-use calls into question the validity of economic analyses based on ideal usage and suggests more realistic assumptions may be necessary to fairly compare this program with alternatives.

Less wasteful, but perhaps more insidiously damaging were those owners that failed to clean their filters. Several homes suffered significant basement damage that was apparently caused by clogged screening which deflected water away from the barrel and into the soil around the home's foundation. Considering the potential consequences of improper maintenance, it is unfortunate that among personal interview subjects, mesh socks were only cleaned every 11.5 months on average. It is important to note that significant outliers affected this data, as fully 29% of personal interview subjects had never cleaned their filters at all. The lack of draining and cleaning illustrated in Figure 2 suggests that future programming will require either more selective recruitment or more extensive outreach.

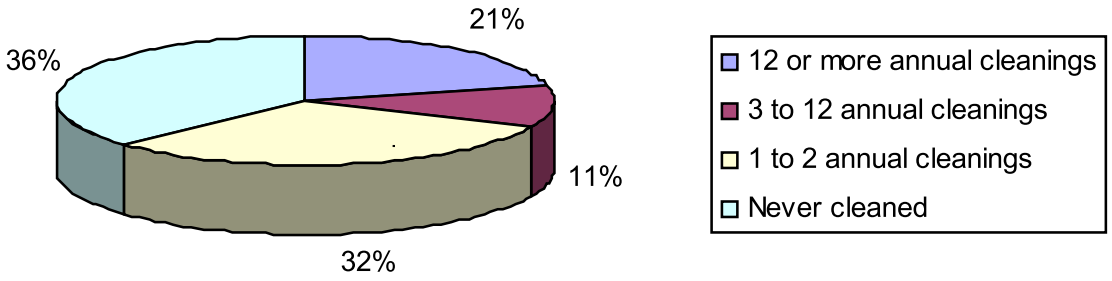
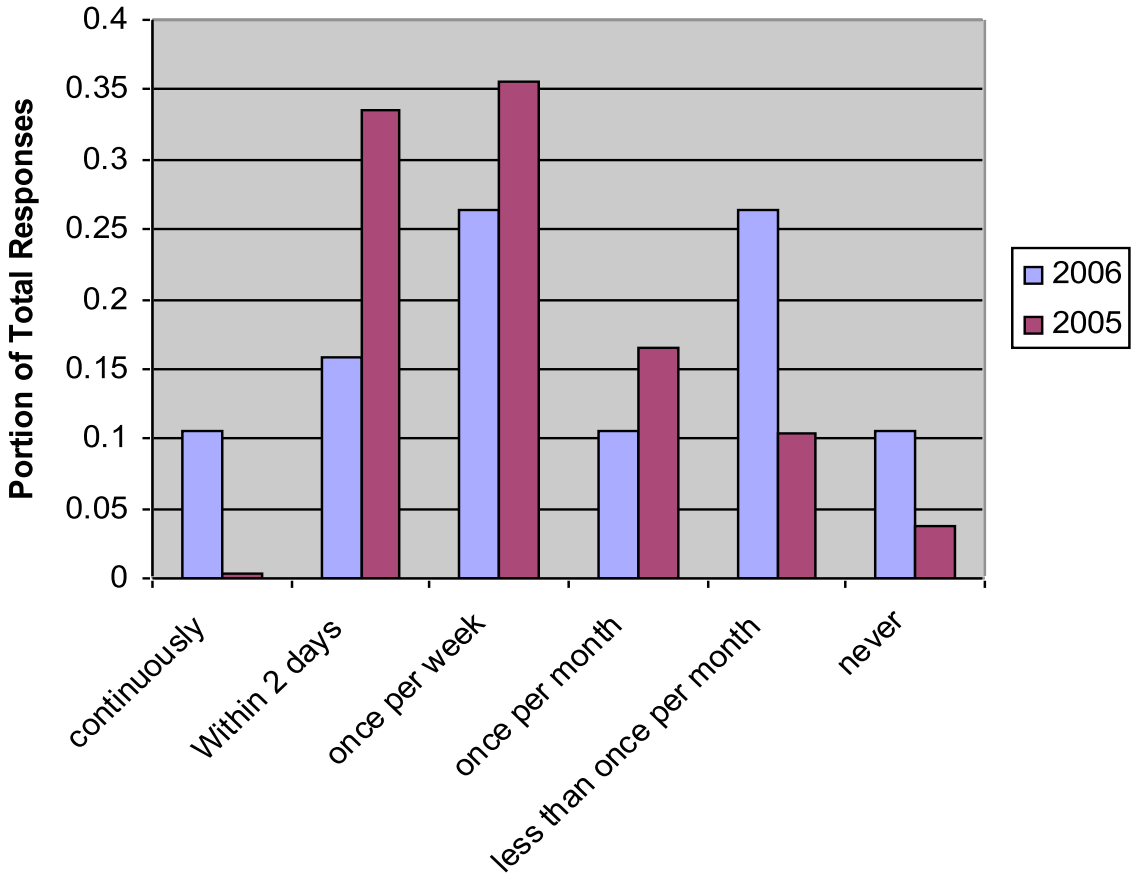



**Figure 2:** Frequency of mesh sock cleaning

The 2005 follow-up survey found more positive results than the present study, with 57% of respondents reporting they had drained their barrels within a week of a rain event, and 17% the day after a rain event. The differences between the two studies, highlighted in Figure 3, might be explained in part by differing sampling methods and in part by actual changes in behavior through time. The data presented here on usage and maintenance was collected through a stratified random sample of all rain barrel owners,




while the data from the earlier study was collected through voluntary responses to a mailing. Although self selection was a factor in both studies, it was likely stronger in the 2005 follow-up survey. Those who chose to return their survey were probably more interested in the program than those that did not return the survey and thus might positively skew the results. Additionally, it was more difficult for respondents to make

overly optimistic claims about their use and maintenance in the present study than in the mail-in 2005 study, because an intern was on-site to check responses against the actual condition of the barrel in the present study. Another possible source of the observed difference in behavior between the two studies is that rain barrel owners actually did drain and maintain their barrels more when the program began and have since become less interested in the project and less likely to drain or maintain their barrels frequently. The difference between the 45% response rate for the 2005 survey and the 20% response rate for the mailing portion of the 2006 survey supports this explanation.

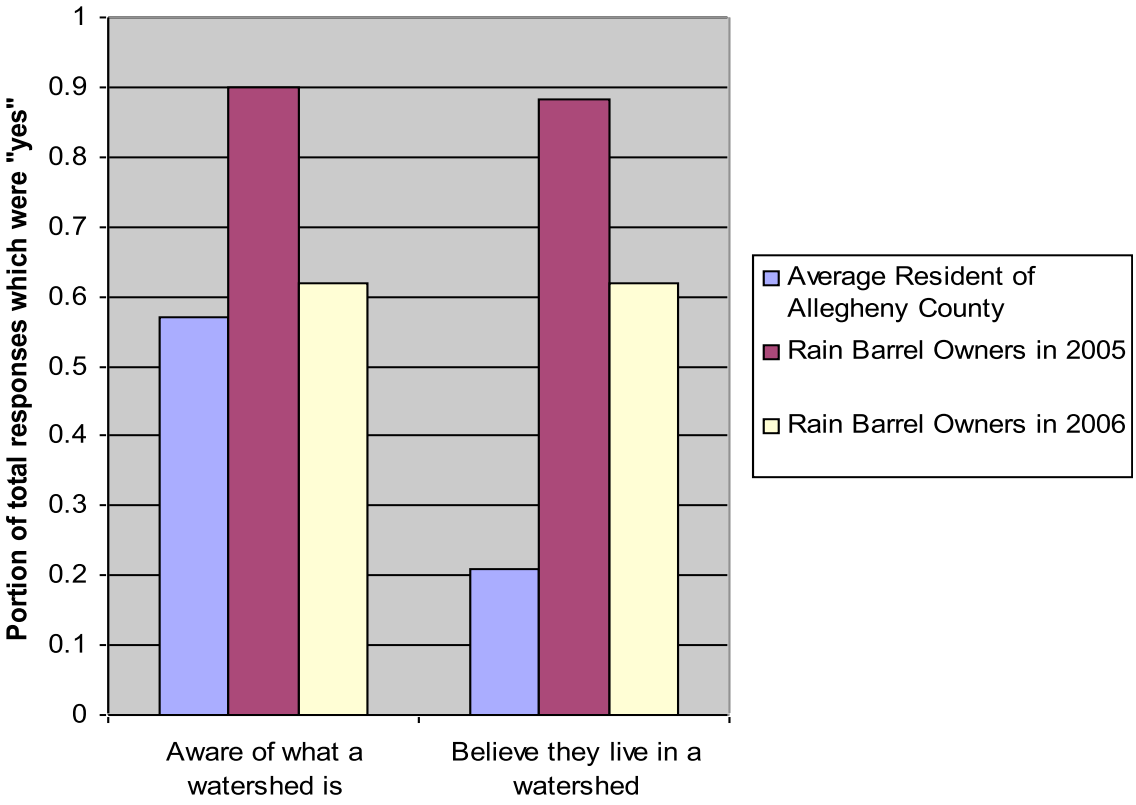
**Figure 3:** Frequency of rain barrel drainage

## Educational Value

Although nine of twenty-three directed questions in the personal interview were designed to assess the effect of owning a rain barrel on one's awareness of watershed issues, the results are still largely ambiguous. A survey conducted for NMRWA in 2004 by Oraclepoll Research (see Appendix O) and the follow up survey conducted in 2005 are the most useful baselines against which to compare the results of the current study. Figure 4 shows that respondents to the 2005 survey showed significantly higher rates of watershed understanding than either 2006 interview subjects or average residents of Allegheny County. The selection bias for the 2005 results discussed earlier should be considered with these results. Despite the finding illustrated in Figure 3 that rain barrel owners are almost three times as likely as those without barrels to understand that they

live in a watershed, it is still unclear whether owning a rain barrel is primarily a consequence or a cause of greater awareness and engagement in watershed issues. This

**Figure 4:** Understanding of watershed concept




is because those residents who chose to have a rain barrel installed on their property probably had an above average understanding of the watershed concept before receiving the barrel. The fact that 47% of personal interview subjects felt they had become more interested in water issues as a result of owning the barrel suggests a causal link between owning a barrel and becoming more interested in watershed issues, however this finding does little to illuminate the strength of this relationship. Thus we are left without a clear idea of what the educational value of owning a rain barrel may be.

## Discussion

The tendency for individuals to tailor their answers to meet the expectations of the questioner should be acknowledged for its potential to skew the data presented herein. This bias would tend to inflate the benefits of rain barrel ownership, and the inherent difficulty of accounting for this effect in the present study should be considered. Further investigation of rain barrel use should focus both on developing a more accurate estimate of draining habits, perhaps by direct observation, and on illuminating the relationship between rain barrel ownership and citizen engagement.

The results of the current study indicate that there is insufficient communication with rain barrel owners. Too many owners fail to use and maintain their barrels, while many still don't understand the real purpose of the project. These two problems are both rooted in a lack of outreach. Further contact will ensure that all owners understand their role in protecting water resources in the Nine Mile Run Watershed, as well as how to best fulfill that role. This will likely require periodic personal contact. There are many ways to facilitate such contact, and it may be valuable to cultivate neighborhood leaders to coordinate such activities (see Appendix O).

Another approach to handling this problem is to reduce the amount of contact that is necessary. This could be achieved through an improved barrel design that reduces the necessary interactions between the owner and the barrel. Configuring standard installations with a low-flow soaker hose would reduce the need for constant drainage among users. Removal or modification of the mesh sock would also reduce the need for cleaning among users. Taken together these measures might increase the technical success of the program without requiring extensive additional outreach (see Appendix P)

During its first two years, the rain barrel initiative has enjoyed significant success (see Appendix Q). It appears that participants are generally pleased with the program and that there have likely been reductions in peak storm flows as a result of storm water retention in rain barrels. However, the burden of constant drainage and maintenance has led to property damage in extreme cases and dissatisfaction in other cases. Furthermore, the theoretical capacity of the barrels has not been reached, and inconsistent drainage makes it difficult to predict the impact of the project. Therefore, future programming and

barrel design should be tailored to facilitate communication between rain barrel owners and the NMRWA, while creating a barrel that is more user friendly.