Changing Bangor Area Lawn Care Behavior

Results from the Evaluation Survey

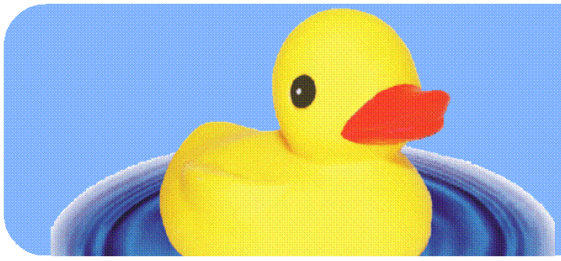

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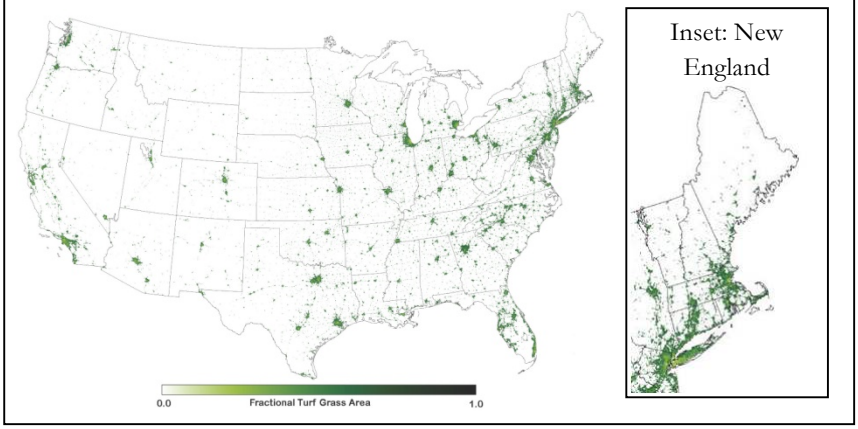
Table of Contents

1. Introduction

1.1. Lawns, Nonpoint Source Pollution, and the Environment

Since its original colonization in the late eighteenth century (Jenkins 1994) the turfgrass lawn has grown to dominate yards, parks, athletic fields, golf course, waysides, and just about every open space managed by Americans, blanketing an estimated 32 million acres across the country (Milesi et al. 2005). According to a study by Robbins & Birkenholtz (2003), lawns in the United States inhabit approximately 23% of all developed land and have become the dominant land cover type for urban areas. Figure 1 shows a national map depicting the percent turfgrass for the contiguous United State, including an inset of New England (map provided by Milesi et al. 2005). Furthermore, the American lawn receives more care, time, and attention from individuals and households than any other natural space (Robbins 2007). Americans spend an estimated 40 billion dollars a year on lawn care, which is more than the Gross National Product of Vietnam (Steinberg 2006). A major driver of this expansion and obsession with lawns is the socio-cultural importance of lawns in the United States that had developed over the past sixty years (Jenkins 1994; Steinberg 2006; Robbins 2007).

Figure 1: Percent Turf Grass across the US



The affects of lawns and lawn care behavior contribute to a variety of negative impacts on the environment, including degrading water quality through the use of lawn chemicals (such as fertilizers and pesticides), diminishing air quality through lawn mower exhaust, and increasing water consumption for watering (Bormann et al. 2001). An issue of particular importance concerns fertilizer and pesticide runoff from lawns, which is a significant contributor to nonpoint source pollution (NPS). Fertilizer runoff has been associated with algal blooms, eutrophication, and contaminated groundwater and pesticides can be very toxic to humans and copious non-human species. In fact, the United States Environmental Protection Agency (EPA) states that nonpoint source pollution is the Nation's leading source of water quality degradation (EPA's "Managing Nonpoint Source Pollution from Households" 2009).

The harmful lawn chemicals, which are found in increasing abundance in the nation's surface and ground waterways, remain largely unregulated despite congressional appeals and testimony (Guerrero 1990). It is also noteworthy to mention that NPS problems caused by fertilizer and pesticide use have yet to be adequately addressed some 30 years after the passage of the Clean Water Act (Adler et al. 1993). This is testament to the difficulty in managing NPS pollution not only due to its diffuse source, literally millions of lawns across the country, but also because it works against the cultural auspices of maintaining the traditional lawn.

The harmful lawn chemicals which are found in increasing abundance in the nation's surface and ground waterways remain largely unregulated despite congressional appeals

There are a range of organizations interested in influencing lawn care practices, such as University extension, watershed councils, and state and federal agencies. In most cases, these organizations are encouraging voluntary behavioral changes aimed to reduce environmental impacts, such as leaving clippings on the lawn, eliminating the use of lawn chemicals, and mowing less often. These non-regulatory approaches used to address this issue seem the best, and perhaps only, method given the challenges present for addressing NPS pollution. However, there has been very little research that either investigates lawn care behavior or evaluates the effectiveness of programs used to promote environmentally responsible lawn care behavior (Robbins et al. 2001).

1.2. Changing New England Lawn Care Behavior Project

To help address the issue of NPS pollution from lawns in New England the research project titled *Changing Homeowner's Lawn Care Behavior to Reduce Nutrient Losses in New England's Urbanizing Watersheds* was developed (USDA CSREES (now NIFA) project # 2006-51130-03656). This project was funded by the United State Department of Agriculture's (USDA) Cooperative State Research, Education, and Extension Service (CSREES), which recently was renamed to be the National Institute for Food and Agriculture (NIFA). This regional study is located in the northeastern region of the United States and includes the states of New Hampshire, Maine, Vermont, Rhode Island, and Connecticut.

This research project is a multiple university trans-disciplinary project integrating different academic fields into a cohesive effort, and is quite novel in its subject, extent, and multifaceted collaboration. The universities involved include the University of New Hampshire, the University of Maine, the University of Connecticut, the University of Rhode Island, the University of Vermont,

and Plymouth State University. This project involves the integration of both soil chemistry and social science research. This project also employs the knowledge, expertise, and efforts of various extension programs throughout the region for guidance and implementation. This group corroborates the scope and complexity of the issue at hand, and the necessity of having such a diverse interdisciplinary team.

Many beneficial research and extension outcomes are expected as a result of this project. The soil science research was used to develop regionally specific recommendations for fertilizer use to minimize negative water quality impacts. The social science research looked into lawn care behaviors, the underlying factors that drive that behavior, the correlates of environmentally responsible behavior, and important considerations for program delivery. Additionally the level of trust and influence of opinion leaders (e.g. Master gardeners, local garden centers, mass media) and the relative influence of different types of informational messages was assessed. This research was instrumental in determining how best to facilitate behavioral change by elucidating target "problem" behaviors, better understanding the attitudes and concerns of the audience, guiding the development of appropriate messaging, and discerning the best avenues for information dissemination. Based on the research, outreach and education messages and delivery methods recommendations were developed for extension.

1.3. Work in the Bangor Area

This report presents the work that has been conducted in the Bangor Area of Maine, as part of the *Changing Lawn Care Behavior to Reduce Nutrient Runoff in New England's Urbanizing Watersheds* project and partnering with the University of Maine Extension Services, and the Bangor Area Stormwater Group (BASWG). A behavior change outreach and education campaign was developed and implemented throughout the communities of Bangor, Brewer, Veazie, Hampden, Milford, Old Town, and Orono. All the campaign materials, and dissemination methods, were guided by key findings from an initial region wide study of community lawn care behavior. The campaign material can be viewed in the appendix of this report.

Figure 2: Map of Bangor Area

Additionally a project evaluation study was conducted after the implementation of the outreach and education campaign. This evaluation was conducted to establish whether changes in knowledge, attitudes, and behavioral intention has occurred, and to test overall campaign effectiveness. In addition, this evaluation study included a test of normatively framed messaging to see if this method could improve desired outcomes. This report includes discussions of the results of this study, lessons learned, and presents ideas for improving campaign effectiveness. This evaluation study will seek to answer the following research questions:

Evaluation Study Research Questions:

1. *Was the outreach and education campaign successful at encouraging behavioral change?*
2. *Do normative framed messages have a greater impact than messages excluding the use of norms?*
3. *What aspects of the campaign could be improved upon to progress overall effectiveness?*

2. Using Social Norms to Change Behavior

2.1. Lawn Care Social Norms

An immaculate lawn is considered by many to be a civic responsibility and a necessary component of neighborhood living (Steinberg, 2006). As suggested by Shern et al. (1994) lawns are valued for aesthetic, psychological, normative, and economic reasons. Much of this desire to maintain a socially acceptable lawn may be explained by various psychological factors that have been theorized to drive behavior, such as values, attitudes, sense of responsibility, and particularly social norms (e.g. Ajzen and Fishbein 1980; Thogersen 2006; Cialdini et al. 1990). For example, homeowner's commonly feel a sense of responsibility to adhere to their neighborhood's standard of lawn care, which could also be defined as the neighborhood norm. Furthermore, if this individual decides to deviate from this norm, social sanctioning from the neighbors who do fit the norm may ensue (Robbins 2007).

The degree to which lawn norms impact people's decision and behaviors can be profound. As demonstrated by Robbins (2007), many people who intensely manage their lawns with lawn chemicals are often more likely to be aware of the negative environmental impacts caused by these chemicals than the general population. Furthermore, many of these same people express great concern for the environment. Of these seeming conflicting values, the desire to fit the norm and maintain a suitable lawn takes precedence over environmental responsibility. Well aware of the

consequences, these people often choose to perform a behavior that they know could potentially cause harm to the members of their household and the environment.

The desire for a "perfect" lawn is indeed deep-rooted in American culture and involves complex socio-psychological issues, such as influential social norms, that drive lawn care behaviors. Empirical social science research, that can elucidate behaviors as well as the factors that drive behavior, is needed to understand this phenomenon. This understanding will better equip behavior change practitioners to influence meaningful behavioral changes that will reduce NPS pollution and ultimately lead to a healthier environment.

A *social norm* is a shared cultural expectation of behavior that connotes what is considered appropriate and desirable for a given situation

2.2. Using Norms in the Campaign

A *social norm* is a shared cultural expectation of behavior that connotes what is considered appropriate and desirable for a given situation (Scott and Marshall 2005). In other words is a set of beliefs about what people are and should be doing. For example, homeowners may believe that their neighbors apply large amounts of lawn chemicals to their lawns (beliefs about what people are doing) and as a member of a community they also might be expected to produce a suitable lawn (beliefs about what should be done). Many recent studies have found that using social norms in behavior change campaigns concerning environmental issues is a power tool that is able to significantly improve desired outcomes (Griskevicius 2008; Mckenzie-Mohr and Smith 1999). For example, norm based campaigns intending to generate environmentally responsible behavior have been used to encourage towel reuse at major hotels (Goldstein et al. 2008), prevent littering (e.g. Kort et al. 2008; Kallgren et al. 2000; Cialdini 1991), increase curbside recycling (e.g. Schultz 1998; Hopper and Nielsen 1991), encourage the purchase of organic foods (Gotschi et al. 2010), and to reduce household energy consumption (e.g. Schultz et al. 2007).

Norm focused campaign messaging has a lot of merit for creating successful outreach and education campaigns aimed to encourage environmentally responsible behavior. In the article *A Focus of Normative Theory: When Norms Do and Do Not Work* the authors state that, "Our data suggests that including strong normative elements in campaign messages may well be effective in creating desirable conduct" (Kellgren et al 2000, pp. 1011). Much research has gone into understanding how social norms influence behavior and how they can be used effectively by practitioners. Social norms, when used correctly can be an effective and low cost tactic to utilize with behavioral change

campaigns. Additionally, American lawn culture provides an intriguing milieu to further test the use of normative influences in a new context.

3. Evaluation Study

3.1. Methods

A self-administered questionnaire was administered door-to-door in six neighborhoods throughout the Bangor Area. Each of the six neighborhoods was randomly assigned one of three treatments; control, standard messaging, and normative messaging. The normative messaging group and the standard group received all of the campaign material (doorhanger, stencils, and reference to the website) while the control group received no material. The normative message group, however, received a variation of the doorhanger where the content was altered to elicit lawn care norms and encourage participation in this norm. The norm used here was that most neighbors choose not to use fertilizers and pesticides on their lawns (a finding elucidated from the initial research conducted as part of the *Changing Homeowner's Lawn Care Behavior to Reduce Nutrient Runoff in New England's Urbanizing Watersheds* project). See the appendix to view the two versions of the doorhangers used, as well as an example of the stencil.

The methods employed by this study (assigning three treatment groups and comparing differences among groups), known as the experimental design method, was chosen over another common evaluation study method called the pre-test/pot-test method. The pretest/posttest method requires the implementation of two tests, a pre-test (administered prior to campaign implementation) and a post-test (administered after campaign implementation). The experimental design method only requires a onetime survey administration and still allows for comparisons to be made between the groups and is an effective means of determining campaign effectiveness while answering the research questions. See Neuman (2007) for a more detailed explanation of the benefits to using the experimental design method with social science research.

The six neighborhoods were purposively selected using criteria appropriate for the survey methodology and the desired outcomes of the study. All the neighborhoods were selected using local knowledge and were all high amenity suburban communities with heavily managed lawns. These neighborhoods were also chosen to be spatially diffuse to prevent "overflow" of campaign exposure. It is imperative to the study that neighborhood are only exposed to their intended treatment as not to botch the comparisons that will be made between neighborhoods.

Given the relatively small population size, the nature of the research questions, and the logistics of campaign delivery the drop-off/pick-up method was deemed best for this study. With this method researchers personally deliver the questionnaires and cover letters door to door to the homes in the study neighborhoods. Respondents were instructed to complete the questionnaire and hang it on their doorknob in a provided bag during established pickup times when the researchers would return to collect the completed questionnaire. This method has proven to yield very high responses rates, be appropriate for small sample sizes, and work to develop relationships between researchers and community members. Additionally, this method works will with the experimental design method allowing for control of coverage that would be more difficult for mailed or internet surveys (Steele et al 2001). This survey also employed many techniques outlined in the Tailored Design Method (Dillman et al. 2009) intended to enhance response rates including customizing letters, using multiple waves of contacts with carefully timed reminders, and providing clear information about the need for responses.

3.2. Results

The six neighborhoods that were selected for this study included anywhere from 31 to 54 homes with a total of 244 homes included in the study. Two neighborhoods received the standard campaign messaging, two received the normative messaging, and two were used as controls and received no campaign material. The neighborhood response rates ranged from 75% to 31%, with an overall combined responses rate of 57%, which is slightly below the expected response rate for this type of survey at around 65% (n=139) (Steele et al. 2001). This slightly lower than desired response rate can in part be attributed to a snow/wind storm that complicated collection and resulted in several completed questionnaires being lost. Figure 3 below shows the summary for total questionnaires delivered and returned for each neighborhood.

Figure 3: Response Summary

Neighborhood	Treatment	Total attempted	Total refused	Total returned	Response rate
Main Trail	Control	40	0	30	75
Mt. Hope	Control	39	1	25	64.1
Francis	Norm	31	2	20	64.5
Judson Heights	Norm	45	3	26	57.7
Constitution	Standard	54	2	27	50
Hillside	Standard	35	6	11	31.4

Intention to Reduce the Use of Lawn Chemicals

Intention to reduce the use of lawn chemicals was assessed across the three treatment groups to compare for differences. A one-way analysis of variance (ANOVA) test with performed to statistically analyze the responses. ANOVA tests how much the mean values of a numerical variable differ among the categories of a categorical variable. In this instance, the numerical variable is the intention to reduce either fertilizer or pesticide use and the categorical variable is treatment type (standard, norm, and control). In addition a tukey LSD post hoc test was performed so that comparisons across groups could be determined, included mean differences and statistical significance (see figure 4). The tukey LSD shows the relationship of each group and indicates what groups means differ from one another, where as ANOVA simple shows the significance between treatment groups and intention. This post hoc test is essential to this analysis since comparing the differences between each treatment group is essential to the evaluation study.

Figure 4: Post Hoc ANOVA Results: Treatment Type Compared to Intentions

Dependent Variable	(I) Treatment type	(J) Treatment type	Mean Difference (I-J)	Std. Error	Sig.
Intention to fertilize	Standard	Norm	.14382	.11746	.223
		Control	-.09472	.11240	.401
	Norm	Standard	-.14382	.11746	.223
		Control	-.23854*	.10356	.023
	Control	Standard	.09472	.11240	.401
		Norm	.23854*	.10356	.023
Intention to pesticide	Standard	Norm	.18889	.12178	.124
		Control	-.11111	.11687	.344
	Norm	Standard	-.18889	.12178	.124
		Control	-.30000*	.11348	.010
	Control	Standard	.11111	.11687	.344
		Norm	.30000*	.11348	.010

This analysis indicates that according to the differences in mean scores, the standard group is more likely to intend to reduce or eliminate both fertilizer and pesticide use than the control group. Furthermore, the norm group is more likely to intend to reduce or eliminate both fertilizer and pesticide than the standard. The relationship was the desired outcome for this project and indicates that our efforts are having effects in these neighborhoods. Also, the differences between the norm groups and the control groups revealed statistical significance, at a level of .023 for intention to reduce fertilizer use and .01 for intention to reduce pesticide use, revealing a clear difference between these groups (remember that statistical significance is a value of .05 or less). The evidence is clear that the neighborhoods receiving normatively framed messages were the most likely to express intention to reduce lawn chemical use, and future messaging should be developed with this finding in mind.

Exposure to the Campaign

Questions were asked concerning whether or not neighborhood residents have been exposed to any of the campaign materials including the doorhanger, the stencils, and the web material. The results of this evaluation study indicate that both the doorhangers and the stencils were highly visible in these neighborhoods, see figures 5 and 6. However, the website was rarely visited, highlighting an area for improvement for this campaign (see figure 7).

Figure 5: Exposure to Doorhangers by Treatment Type

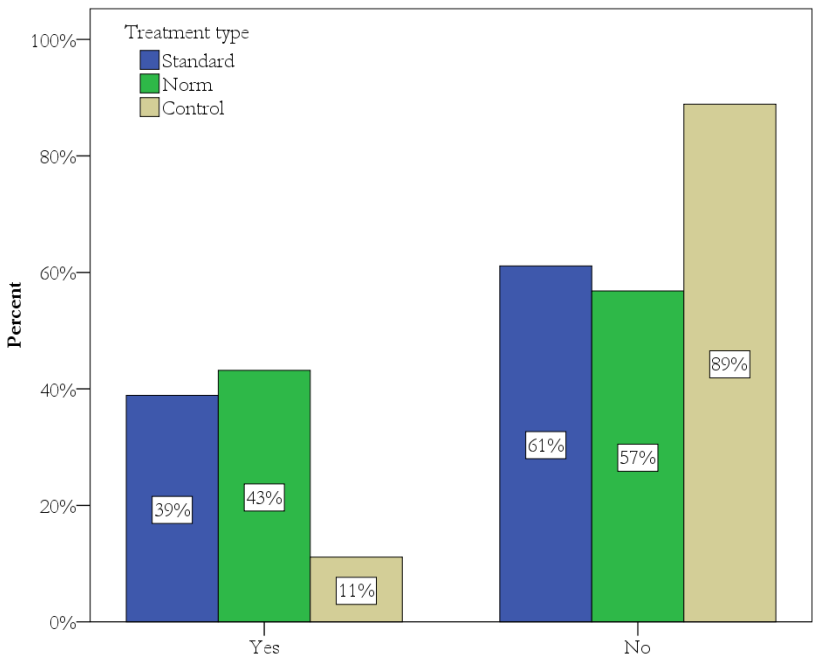


Figure 6: Exposure to Stencils by Treatment Type

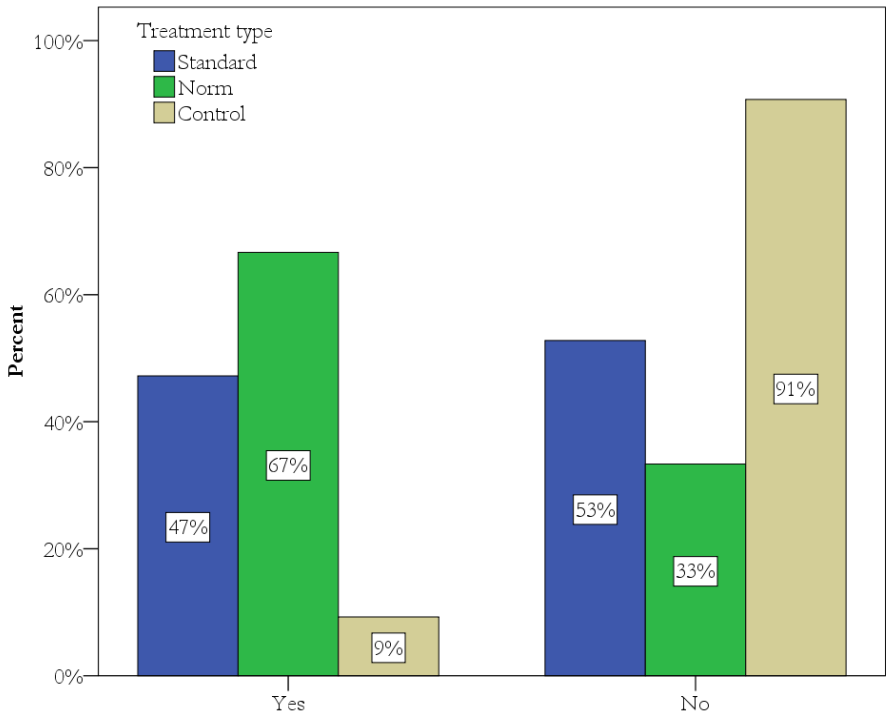
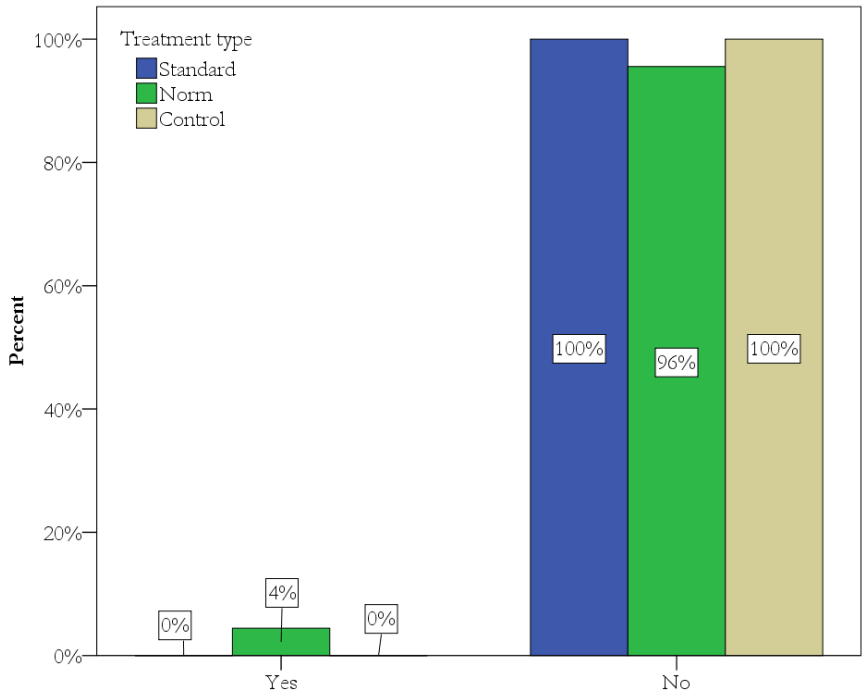


Figure 7: Exposure to Website by Treatment Type



Furthermore respondent were asked if they had seen or heard about any BASWG activities or information from the following media sources: newspaper, television, radio, internet, and a fill in the blank "other" option. Very few of the respondents indicated that they had seen or heard any BASWG activities. The most notable results are: 11% of respondents indicated they had seen BASWG on television and 5% saw us in the newspaper. Responses for the "other" category include: at a local fair, at work, and from a friend.

Neighborhood Perceptions of Lawn Care Issues

A series of questions were asked concerning how respondents think their neighbors maintain their lawns and what the neighborhood attitudes are concerning lawn care behavior. This information can be useful to determine what the neighborhood standards of lawn care are, and how this might be used to direct future campaign efforts. Despite my hopes, statistical analysis reveals no meaningful differences across the three treatment groups. Therefore these questions will be analyzed using the total population, rather than treatment by treatment. This also indicates that despite the normative messaging presented to the two norm treatments, those respondents were not more likely to acknowledge the presented norms.

Most respondents either disagree or strongly disagree that people in their neighborhood choose not use fertilizers and pesticides on their lawns. This is affirmed in figure 8 (next page) showing that most respondents agree or strongly agree that most of their neighbors use lawn chemicals. This is indicative of the perceived prevalence of lawn chemical use, and should be a target for future outreach and education campaigns. Additionally most respondents indicated a high concern for protecting water quality in their neighborhoods see figure 9 (next page). These results are similar to the results found be Robbins (2007) where residents express concern for the environment, yet still choose to apply deleterious chemicals.

Figure 8: Level of Agreement that Most Neighbors Use Lawn Chemicals

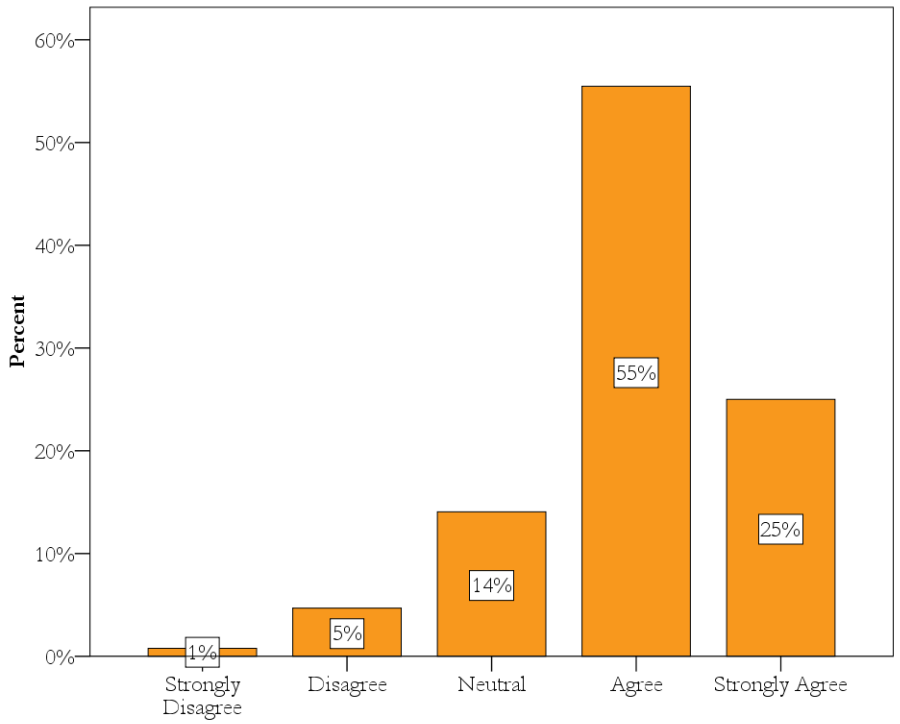
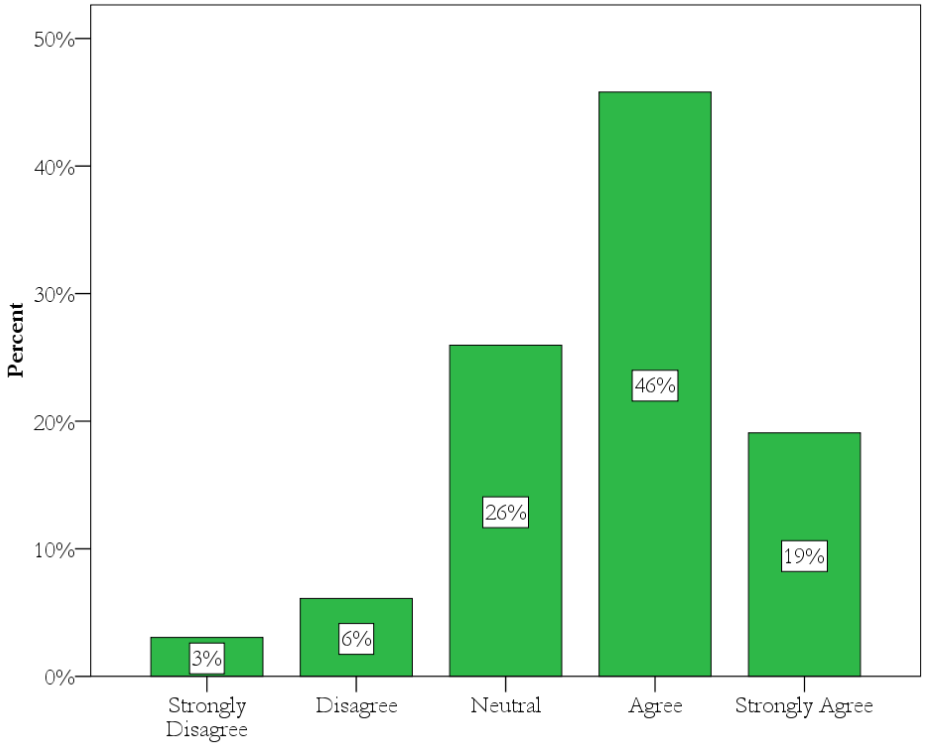


Figure 9: Level of Concern for Water Quality



How often do you Apply Lawn Chemicals?

Questions 3 concerned how much lawn chemicals are applied to the respondent's lawn. After performing statistical analysis, no significant differences were discerned between treatment groups. Therefore this section is also analyzed at the whole sample level. Most residents of these neighborhoods indicated that they apply fertilizers, pesticides, and combination weed and feed products at least 1 time a season. Pesticides however, had the highest percentage of respondents indicating that they did not apply at nearly 50%, see figure 10. Fertilizer application is very common in these neighborhoods as can be seen in figure 11, with many respondents applying more than once a year. Weed and feed products are also quite popular, again with many respondents applying more than once a year. These results are slightly different than those of the initial lawn care study which found that most people actually do not apply fertilizer to their lawns.

Figure 10: Number of Pesticide Applications Last Season

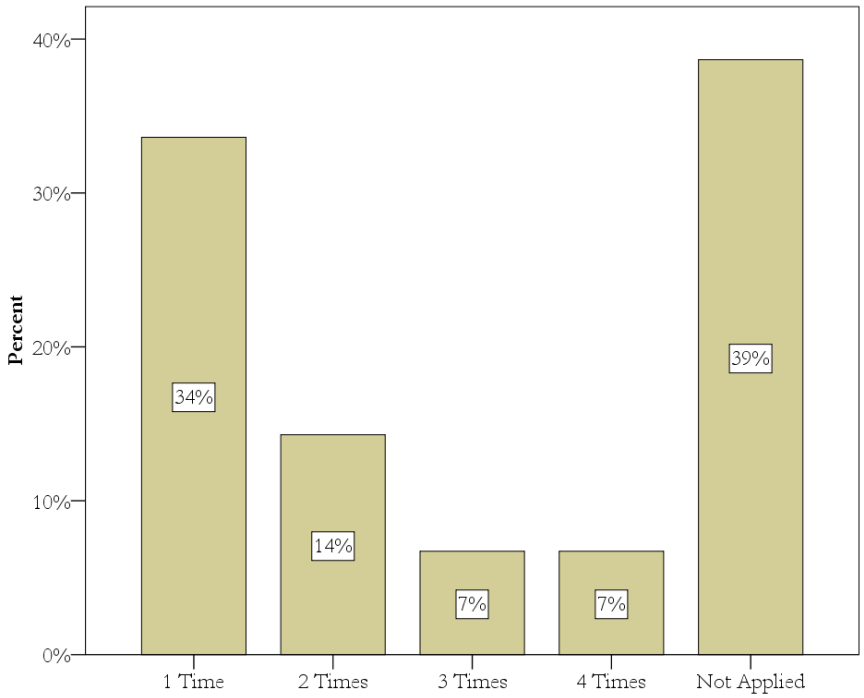
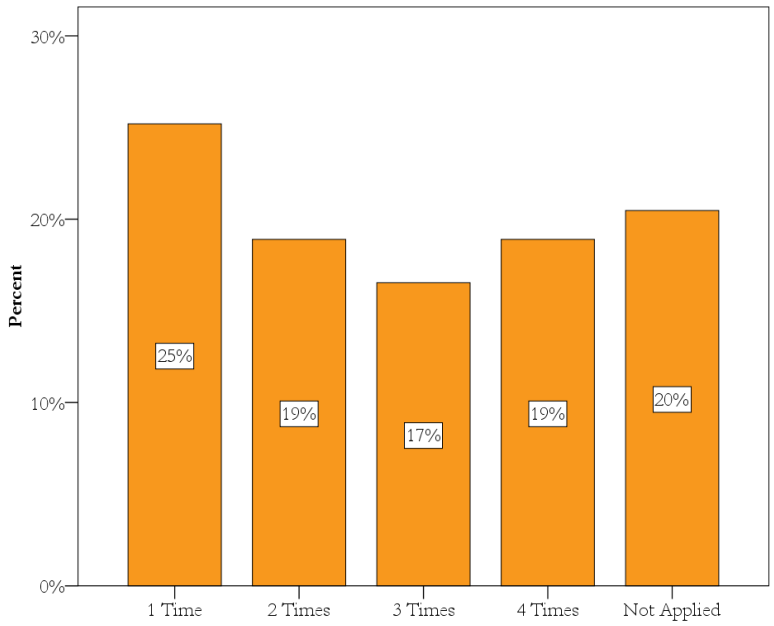
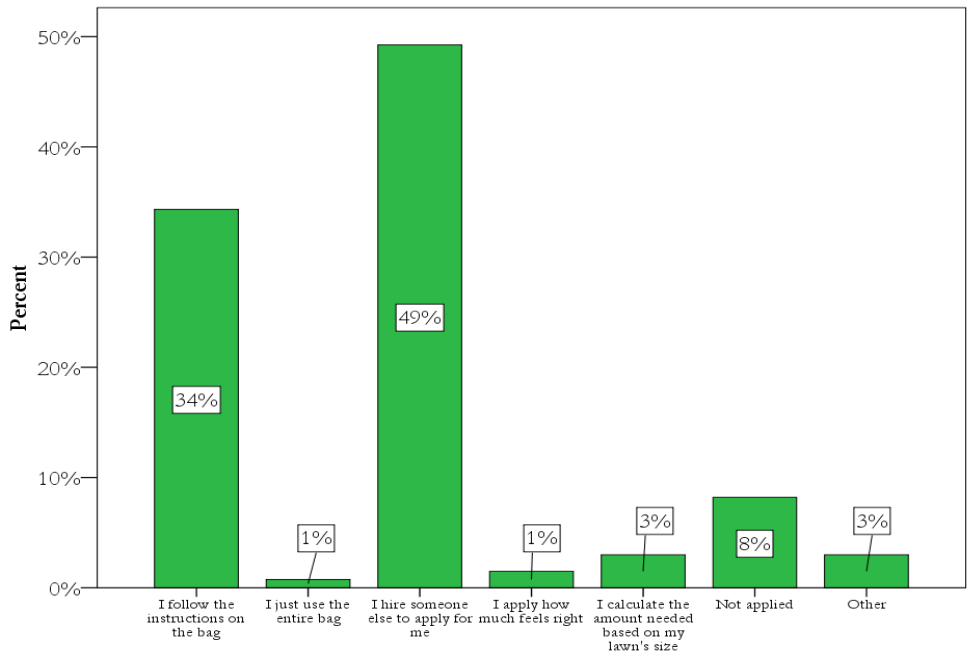


Figure 11: Number of Fertilizer Applications Last Season



An additional question asked what method respondents use to determine how much lawn chemicals to apply. Most notably, 49% of respondents hire someone to apply their chemicals for them and another 34% follow the instructions on the bag, while the other methods presented are only marginally used (see figure 12 below).

Figure 12: How Respondent's Determine How Much to Apply



Knowledge about nutrient runoff

Questionnaire items were included to test respondents knowledge about the adeverse affects of lawn chemicals to the envrionment. After statistical analysis, no significant differences were found across groups. This finding is unfortunate in that I was hoping differences would be found and we could assert that our campaign increased knowledge signigicantly, perhap explaining the differences in intention. As can be seen in figure 13 and 14 the vast majority of repsondents agree or strongly agree that lawn chemicals can cause harm to kids (84%) and pets (88%). These high levels of agreement acorss the board indicate that there is likely preexsiting knowledge of potetial harm to kids and pets, and while our campaign material may in fact be increasing knowledge this change is not explained strongly by the data.

Figure 13: Level of Agreement that Lawn Chemicals can cause Harm to Kids

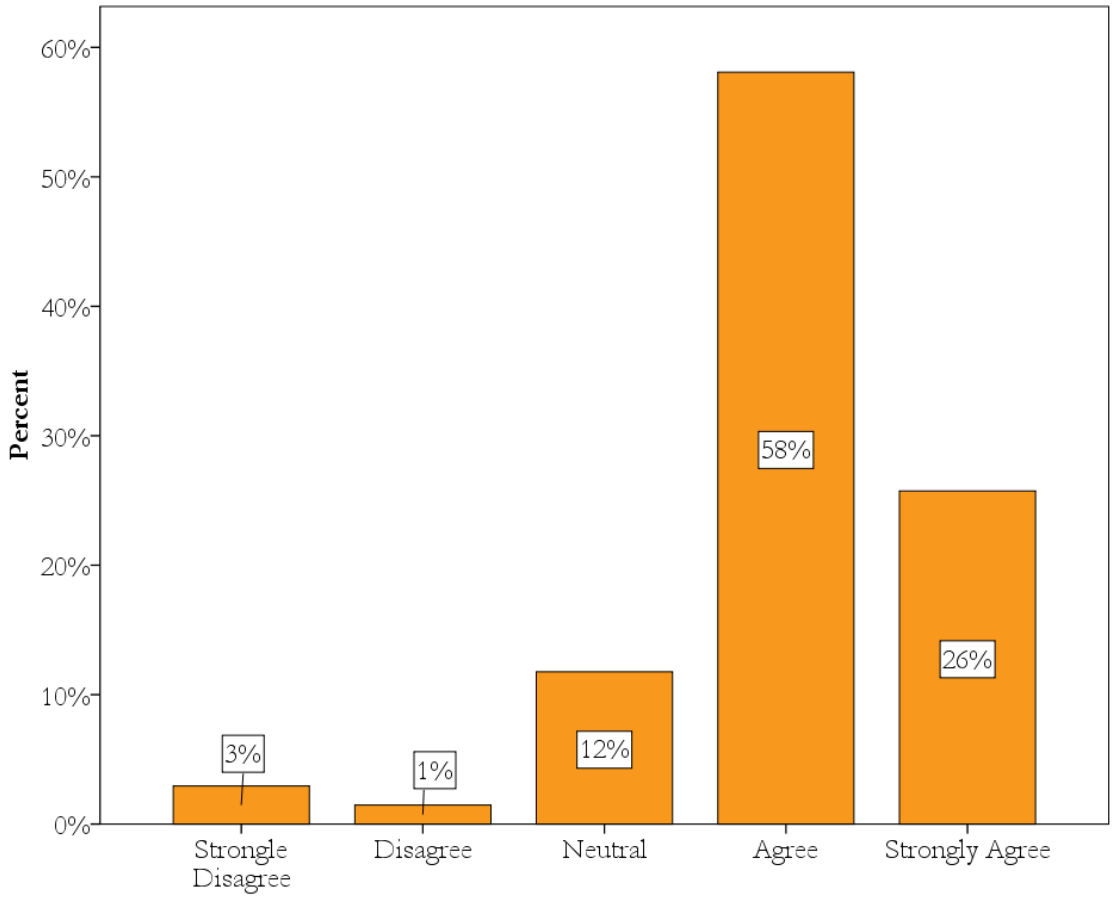
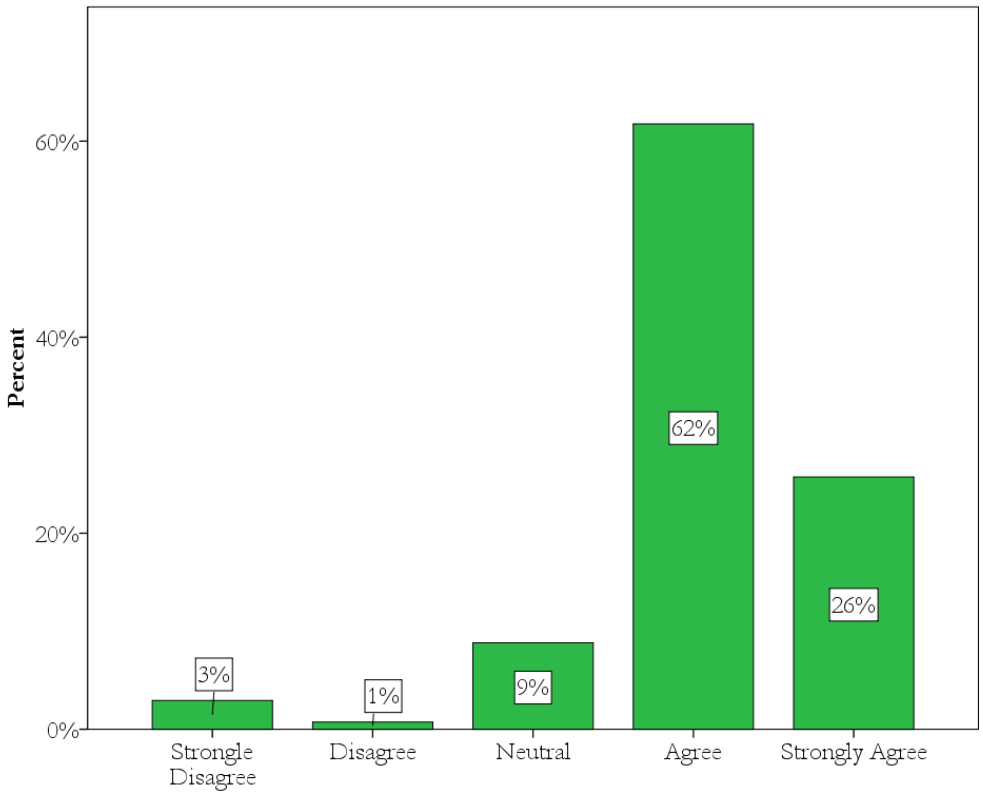


Figure 14: Level of Agreement that Lawn Chemicals can cause Harm to Pets



Respondents were asked if they agree that lawn chemicals do not affect have negative impacts on water quality. The majority of respondents either disagrees or strongly disagrees with this statement at 66% (see figure 15). Another 26% indicated that they were neutral so perhaps these respondents, and those who disagree with this statement, could be targeted for future educational campaign making the link between lawn chemical use and potential affects to local water quality. Additionally, respondents were asked if agree that lawn chemicals can runoff into local waterways, see figure 16. Most respondents (88%) agree or strongly agree that chemicals can runoff into waterways. These findings suggest that most respondents have a preexisting understanding that lawn chemicals can runoff into waterways and negatively affect water quality. While this information should not necessarily be excluded from future material, the data suggests that putting an emphasis on other information, such as shifting norms, to facilitate change may be more effective.

Figure 15: Level of Agreement that Lawn Chemicals do not affect Water Quality

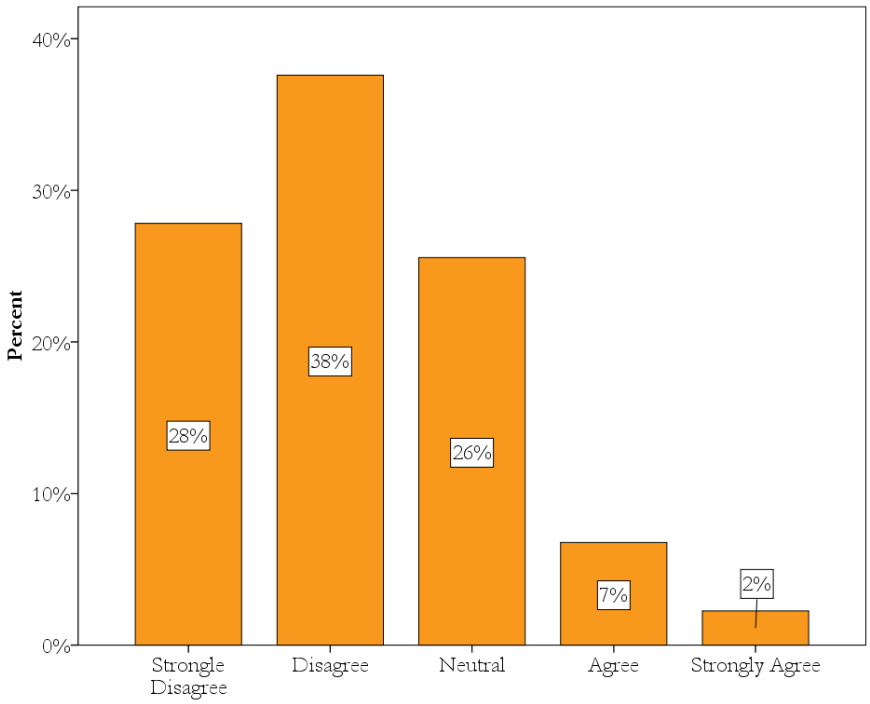
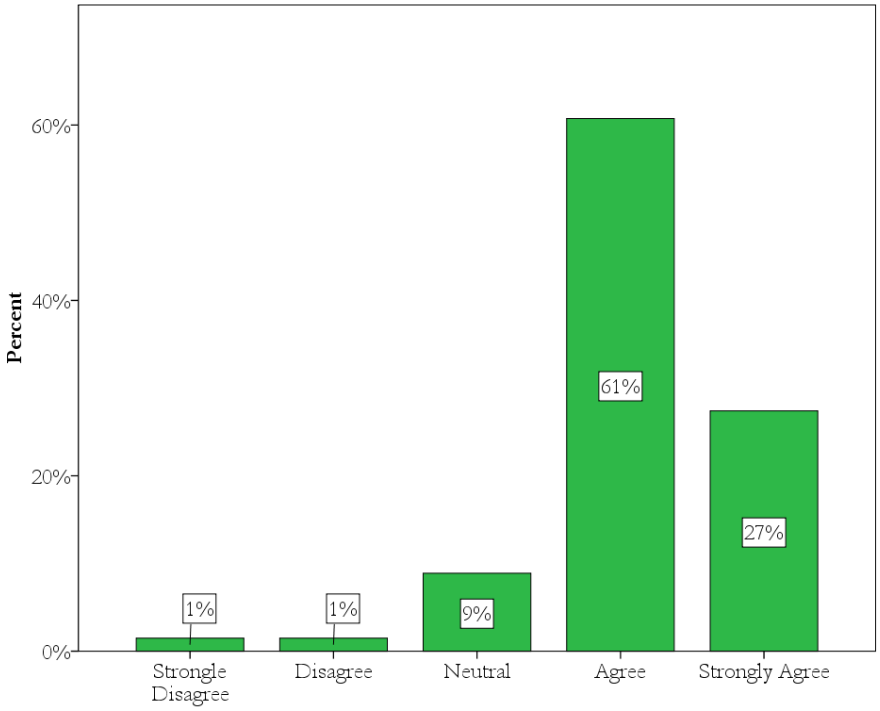


Figure 16: Level of Agreement that Lawn Chemicals can Runoff into Local Waterways



Demographics

Demographic questions were included in the questionnaire so that responses from people of differing background characteristics could be compared to identify any important trends across groups. In this case statistical analysis revealed no significant demographic differences within the sample. However, when compared with census data, some notable differences can be seen between our sample and averages for the state of Maine. For example, these neighborhoods are in a higher income and education bracket than typical for Maine (www.factfinder.census.gov). This was expected since these neighborhoods were selected to be high-amenity. This may explain some of the discrepancy between the initial lawn care study and this evaluation study, where in the initial study the norm was not to apply and in this study the norm is to apply. These results suggest those high amenity neighborhoods are more likely to apply lawn chemicals, which supports a recent study correlating lawn expenditures and lawn greenness by Zhou et al. (2009). This also affirms those high amenity neighborhoods are a good target for future campaigns aimed to reduce the use of lawn chemicals.

Another finding from the demographics section of this study found that 54% of the respondents have lived in their communities for 5 or less years. Some of the neighborhoods in the study area are newer developments (e.g. Mt. Hope and Judson Heights). Perhaps many homeowners' in these neighborhoods are attempting to establish new lawns and this could explain the higher frequencies of lawn chemical application.

4. Summary

Many respondents from the sampled neighborhoods do indeed use lawn chemicals as part of the lawn management behavior. Our efforts have shown to be successful at changing intention to apply lawn chemicals next season. Additionally, the use of normative framed messaging has proven to have a greater impact than messages without this framing. Future campaigns are needed to continue to affect people's lawn care decisions and norms can be a powerful tool.

As was the case with the initial lawn care survey, this evaluation found that most people get their lawn chemical application information from the product packaging. This affirms the need for point of sale products in place in stores, as well as a continuation of education and outreach. This is a great place for the dissemination of the site specific fertilizer recommendations developed from the soil science component lawn care project.

Many respondents in these neighborhoods utilize lawn care services. It would behoove us to consider this issue with both homeowners and lawn care service providers to encourage the use of more environmentally responsible lawn care techniques. Additionally, as affirmed in this study and the initial study, there is an expressed concern for water quality, lawn care alternatives which still maintain the community's standard of lawn care need to continue to be encouraged.

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