

Changing Homeowner's Lawn Care Behavior to Reduce Nutrient Losses in

New England's Urbanizing Watersheds



Applying knowledge to improve water quality

New England Regional Water Program

*A Partnership of USDA CSREES
& Land Grant Colleges and Universities*

Social Science Results Summary

Nutrient losses from common lawn care practices, such as fertilization, have been identified as significant contributors to Non Point Source Pollution (NPS) in New England's watersheds. In order to create an effective educational outreach program to stimulate the use of more environmentally responsible lawn care practices, and reduce this source of NPS, a significant amount of social science research has been conducted to inform the design of a marketing program informed by the principles of community based social marketing. This executive summary highlights the key findings from the survey portion of the project to aid in the creation of outreach and education messages.

The question of what motivates environmentally responsible behavior in lawn care is important to the future of environmental health throughout the Northeast. Attempting to get landowners to lessen the negative impacts lawn care practices have on their watersheds has become a focus of Extension efforts throughout the region, however little research exists on the means for achieving this goal. Designing an outreach program that leads to measurable change in the practices small-scale landowners use to care for their landscapes is a challenge that can best be met through the application of findings from hypotheses-driven social science research. Instigating behavioral change among landowners in a watershed can be a complex task because of the myriad issues involved in fostering environmentally responsible behavior, however existent social science research provides a framework that can be used to successfully structure this inquiry.

The social science research was conducted using methodological triangulation by engaging in qualitative, in-depth interviews with turf care opinion leaders throughout New England to ascertain their perceptions of, and opinions about, critical turf care issues related to water quality. In addition to being valuable information in its own right, the data collected and analyzed was also used to inform the quantitative stage of data collection. The social science research segment of the project was designed with 4 goals:

1. Explore primary drivers of do-it-yourselfers' (DIYs) lawn care choices and practices, especially with regard to fertilizer application. Information from non-DIYs will also be analyzed.
2. Investigate perceived barriers and benefits to adoption of more water quality-friendly nutrient application practices.
3. Examine relative measures of trust and frequency of contact for various sources of yard care information by neighborhood residents.

4. Determine effectiveness of trained opinion-leaders (such as Master Gardeners, local garden center staff, alpha neighbors, Extension staff, etc) to influence residential nutrient management behavior in neighborhoods.

The executive summary is divided into 3 major sections. The first section provides a brief summary and review of the results from the in-depth interview stage of the project, and identifies a few of the ways the information collected informed the survey stage of the project. The second section describes the survey process and reviews key findings from the data analysis. The final section of the document highlight recommendations for developing outreach and education based on the information collected and analyzed.

Results from In-Depth Interviews with Turf Care Opinion Leaders

The first stage of this triangulation approach to data collection involved a series of 52 in-semi structured in-depth interviews, conducted across New England, with opinion leaders in turf management. Opinion leaders were identified as being influential voices, and sources of information in the realm of turf management. The initial pool of respondents was purposively sampled based on information provided by Extension professionals working in the study communities. Additional respondents were identified utilizing a “snowball” sampling technique, where at the conclusion of the interview, opinion leaders were asked to identify other potential respondents. All participants were assured that their responses would remain confidential in order to facilitate the freedom to answer openly. Interviews were largely conducted in person and typically lasted from half an hour to an hour.

In order to facilitate the discussion of relevant topics an opened ended interview protocol was developed prior to these meetings. This protocol provided direction during each interview but allowed for useful digression when previously unrecognized, yet relevant topics emerged. This conversation style interviewing technique uncovered many facets of turf management that have been used by the project team to develop a more complete understanding of turf related issues. Analysis was conducted by inductively identifying themes and concepts common across various orientations, as is common in the sociological analysis of qualitative data. The findings were useful for guiding the development of quantitative research tools, and will be influential in determining the final creation of outreach messages. The experts interviewed purposefully represented a cross section of diverse lawn care orientations, and out of these 52 opinion leaders 4 conceptual categories were created in order to explore differences and similarities existing between groups that have different relationships to lawn care.

Opinion Leader Categories and Their Descriptions:

Industry/ Business Group, These experts have a vested economic interest in the turf industry. These opinion leaders include lawn care company owners, lawn product/chemical suppliers, big box store home and garden employees etc.

Outreach/ Educators Group, Largely comprised of Extension members throughout New England these professionals provide expert advice to the do-it-yourselfer.

Community/Alpha Neighbor Group, These unofficial leaders of lawn care at the neighborhood level do not have a professional stake in the turf industry, however research suggests that these neighborhood level sources of lawn care values, norms and attitudes can be very influential.

Research/Scientist Group, This opinion leader group may have some teaching appointments in institutions of higher learning but their main focus lies in research related to turf related topics. They include water, soil, turf, and horticulture scientists.

State by State Analysis

Across New England there are a diversity of issues regarding turf management and water. The differences that exist between states are important to acknowledge when developing regionally specific education messages. Factors such as the length of a state’s growing season, differences in state laws pertaining to the use of certain fertilizers, or set limitations for outdoor water usage will affect DIYer’s perceptions of messages and affect the impacts of certain messages and

themes. Better understanding the existing differences and similarities between populations in this project's target audiences will aid in guiding efforts to make certain elements of the project's outreach regionally relevant, and ultimately more effective. As a result an additional analysis of the qualitative data at the state level has been conducted in order to expose these regional patterns and differences.

Useful Findings and Their Applications

The data gathered from the qualitative phase of this research has been inductively analyzed in order to identify useful trends and conceptual categories. It is difficult to overstate the importance and utility of these findings. Selected from a multitude of information the following briefly outlines information that has been identified as being particularly important or as having the greatest implications for outreach development.

Key Findings:

- **There exists a willingness to engage in environmentally responsible lawn care**
- **Many DIYers hold unreasonable expectations related to lawn care results.**
- **A lack of knowledge exists among DIYers regarding effective lawn care techniques, including the proper application of fertilizers.**
- **There is a lack of recognition that home fertilization techniques are linked to water quality issues.**
- **DIYers inaccurately identify organic fertilizers as being a solution to nutrient leaching.**
- **Many Opinion Leaders felt that alternative fertilizing methods would be able to achieve results most DIYers would be satisfied with.**
- **The acceptance of prescribed lawn care practices will hinge on levels of time, money, and labor needed to carry out the recommendation.**
- **Less fertilizer can be applied by DIYers without sacrificing results, due to the tendency for DIYers to over apply.**
- **The standard of lawn care in a DIYer's community has a significant effect on that DIYers lawn related attitudes, values and ultimately their behaviors.**
- **The DIYer's description of a "healthy" lawn usually depicts a high input aggressively managed area of turf.**

Implications for Quantitative Data collection and Message Creation

These findings reveal a number of useful insights for message creation and quantitative data collection. Recognizing the DIYer's existing willingness to be environmentally friendly in their

lawn care practices provides direction for the creation of messages that can address two important factors related to making lawn care decisions. First by outlining the negative environmental effects of current practices outreach will raise awareness amongst DIYers essentially addressing the lack of knowledge regarding the link between lawn care and water quality issues. Secondly outreach efforts can provide a means for DIYers to achieve a desirable lawn while adhering to a turf management strategy that is environmentally sensitive.

Findings also suggest that there is a need to redefine what a *desirable* lawn is. Many opinion leaders felt that the type of lawn DIYers desire is one exhibiting the qualities of a professionally managed high input “golf course”. This can be seen as the presence of thick, dark green uniform grass blades accompanied by the strict absence of any other plant species. This image of the “perfect” lawn is difficult to achieve given the present levels of turf related knowledge, resources the DIYer is willing to spend on their lawn’s appearance and the nature of New England’s climate. Relatedly having a “healthy lawn” was reported as being a common desire of the DIYer, and could likely be seen as a presence of the previously mentioned top three appearance related factors. The idea of what constitutes a healthy lawn is interpreted on a highly variable basis. While there appears that there are commonly held beliefs as to what a healthy lawn looks like, those beliefs aren’t necessarily grounded in research but are likely driven by marketing, community and other various influences. These influences seem to be resulting in a type of lawn that demands high levels of input and intensive management strategies that could easily be interpreted as being unhealthy. Essentially the message will promote a satisfactory lawn that DIYers can expect to achieve through the application of the project’s environmentally sensitive recommendations. The evaluation of these themes through the use of a questionnaire distributed to DIYers will provide support for the inclusion of some concepts while avoiding messages that hold little relevance for the target audience.

The Scientific Survey of Community Residents

To best inform the creation of outreach and education efforts an understanding of the desired audience is essential. To best understand the social dynamics of lawn care decisions by homeowners this project employs a modified form of the theory of planned behavior to conceptually structure the research and guide the data collection and analysis process.

The theory of planned behavior (TPB) can be traced back 30 years to the work of Fishbein and Ajzen (1975) and the creation of the theory of reasoned action (TRA). Since then, numerous investigations of how social-psychological mechanisms shape behavior have continued to shape this theoretical framework for attitude-behavior research (Eagly and Chaiken, 1993). The validity of the TRA and TPB models have been well-supported empirically (Trumbo and O’Keefe 2005) in studies of environmental issues (Bright, Manfreda, Fishbein and Bath 1993; Kantola Syme, and Campbell 1982; Trumbo and O’Keefe 2001; Luzar and Diagne 1999; Heong and Escalada 1999) and in many other studies of the design of communications intended to affect behavior (Rhodes and Blanchard 2006; Griffin, Dunwoody, and Neuwirth 1999). Accordingly this model was applied in this research to identify key information needed for the creation of a successful outreach program, and more details on the theoretical approach are available in the full project proposal, and also upon request from the authors of this report.

The survey research for the project was conducted using a self-administered questionnaire delivered to a randomly selected sample of residents of five purposively selected communities from each state involved in the project. The community selection criteria were developed based on important dimensions of the extension efforts in this project, and a scientifically random sample of 300 community residents was selected in each study community. In addition, in order to facilitate the evaluation of this project’s Extension activities, the community data collection also sampled residents of the neighborhoods targeted for Extension activities by administering the survey to an additional 80 households in each of these neighborhoods. The five communities included in the study were:

- Hampden, Maine
- East Lyme, Connecticut
- Milton, New Hampshire
- Brandon, Vermont
- East Kingstown, Rhode Island

After careful consideration and deliberation the sampling frame for the project was purchased from Survey Sampling International (SSI), a well-known and respected sampling service. SSI draws its records from a combination of phone listings, driver license information, and other available sources and asserts that more than 85% of the residents of a community are accounted for in their data. A review of the information available for the states involved in this research indicated that the rates of representation were even higher. Other options were available for developing the sampling frames, including building off property tax lists, but all introduced more potentially significant biases in the sample than the SSI alternative. It should be noted that while utility connection lists are nearly ideal for developing community samples, a recent NH court ruling made such data unavailable by law.

The survey was conducted in August, September, and October of 2007 using appropriate sociological data collection techniques, and was administered using a modified tailored design method (Dillman 2000) that employs several techniques intended to enhance response rates (including customizing letters, sending carefully timed reminders in multiple waves of contacts, and providing information about the need for responses). Analysis of the survey data was conducted using Statistical Package for the Social Sciences (SPSS).

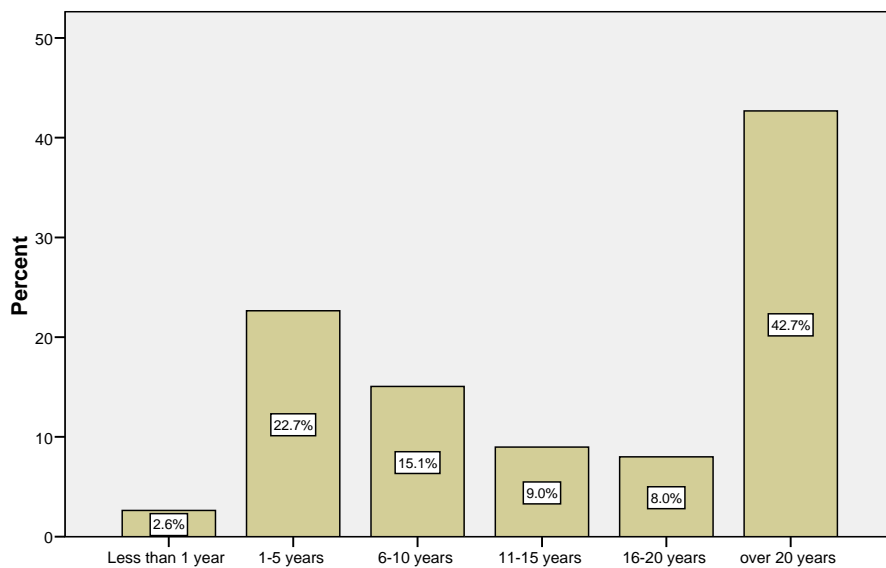
Results of Survey Administration

A total of 350 residents in each community were sampled to ensure that a valid sample of 300 existed in each because of the expectation that there would be some undeliverable addresses. Eighty neighborhood residents were also sampled in each community, to ensure a viable sample of at least 50 in each. A total of 2150 questionnaires were mailed out and 302 addresses were returned as non-deliverable, which results in 1848 eligible recipients. A total of 754 completed questionnaires were returned, for a final response rate of 40.8% (n=754). A response rate of 41%, while not ideal, is absolutely respectable in a general population community survey of this kind.

Who Replied?

A 41% response rate is respectable for a general population survey of this kind, and the information collected provides more detailed and precise information on turf issues than is currently available from other sources. To best understand the data an examination of the characteristics of who responded is an important first step, as it can clarify the characteristics of the sample as well as any inherent biases.

How long have you lived at your current residence?



Does Respondent Rent or Own Property?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Rent	28	3.7	3.7	3.7
	Own	683	90.6	90.6	94.3
	Other	14	1.9	1.9	96.2
	Not Applicable	3	.4	.4	96.6
	Missing	26	3.4	3.4	100.0
	Total	754	100.0	100.0	

What is your gender?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	259	34.4	35.7	35.7
	Male	467	61.9	64.3	100.0
	Total	726	96.3	100.0	
Missing	Missing	28	3.7		
Total		754	100.0		

Respondent's age

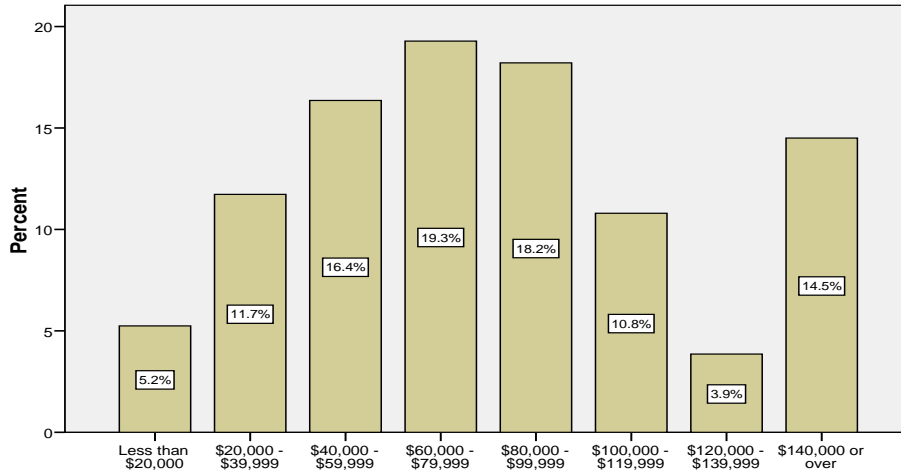
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	21-40	100	13.3	14.3	14.3
	41-60	333	44.2	47.5	61.8
	61-80	225	29.8	32.1	93.9
	81 and over	43	5.7	6.1	100.0
	Total	701	93.0	100.0	
Missing	Missing	53	7.0		
Total		754	100.0		

Which of the following best describes the highest level of education you have completed?

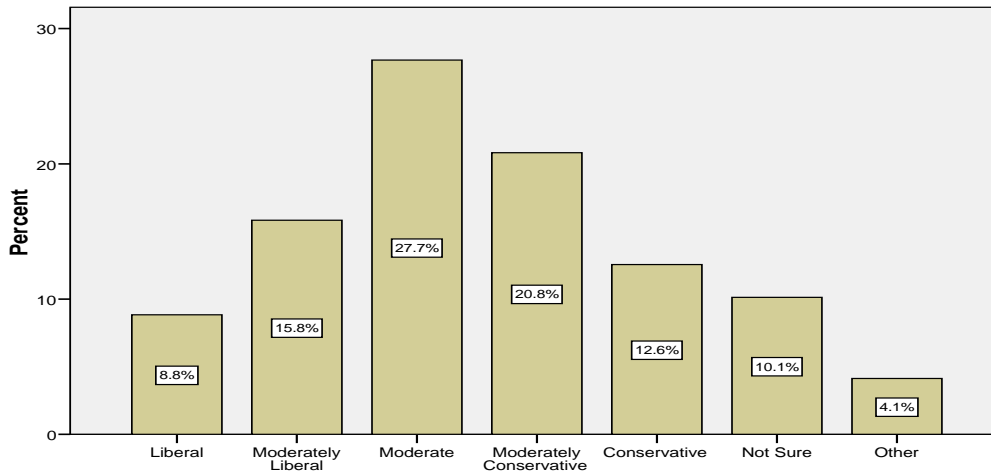
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 12 years, no high school diploma	6	.8	.8	.8
	High school/GED	118	15.6	16.2	17.0
	Some college	152	20.2	20.9	37.9
	Vocational/Trade Certificate	60	8.0	8.2	46.2
	Bachelor's Degree	225	29.8	30.9	77.1
	Master's Degree or higher	167	22.1	22.9	100.0
	Total	728	96.6	100.0	

Missing	Missing	26	3.4	
Total		754	100.0	

Which category best describes your annual household income before taxes?



Which of the following categories best describes your political orientation?



Do you feel your work or business is in some way economically dependent upon the quality of your watershed?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	472	62.6	69.5	69.5
	Yes	207	27.5	30.5	100.0
	Total	679	90.1	100.0	
Missing	Don't Know	10	1.3		
	Not Applicable	5	.7		

Missing	60	8.0	
Total	75	9.9	
Total	754	100.0	

Compared with census data about these communities, the data above indicate that respondents to the survey have higher levels of education, higher average incomes, and are slightly older than residents of the communities as a whole. In contrast, the data for political orientation and home ownership are more evenly distributed. The demographic data for the respondents differs from the census data on residents of these communities in some ways, however it should be noted that these differences are common results in survey research. In addition, a review of these differences suggests that they may well be characteristics of residents more likely to own homes and engage in lawn care, which may not be a detriment for the goals of this research. Overall the data suggest that there can be a high level of confidence in the information collected and that its generalizability is likely to be strong, however as with all data readers are encouraged to think critically about the results.

A particularly surprising and noteworthy result is that slightly over 30% of respondents asserted that their work or business is economically dependent on the quality of their watershed. The percentage of respondents making that connection is higher than anticipated, and the information clarifies that it may be both important and effective to emphasize such factors in education and outreach efforts.

Respondents' Lawn Care Practices

A basic goal of the project was to identify the current lawn care practices homeowners engage in and some of their perceptions of the basic norms governing lawn care. The following section highlights some of the important results from the survey effort to learn about these issues.

Respondent's Level of Agreement that they Enjoy Spending Time on Lawn Care

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	56	7.4	7.6	7.6
	Disagree	127	16.8	17.3	24.9
	Neutral	200	26.5	27.2	52.1
	Agree	279	37.0	38.0	90.1
	Strongly Agree	73	9.7	9.9	100.0
	Total	735	97.5	100.0	
Missing	Don't Know	1	.1		
	Missing	18	2.4		
	Total	19	2.5		
Total		754	100.0		

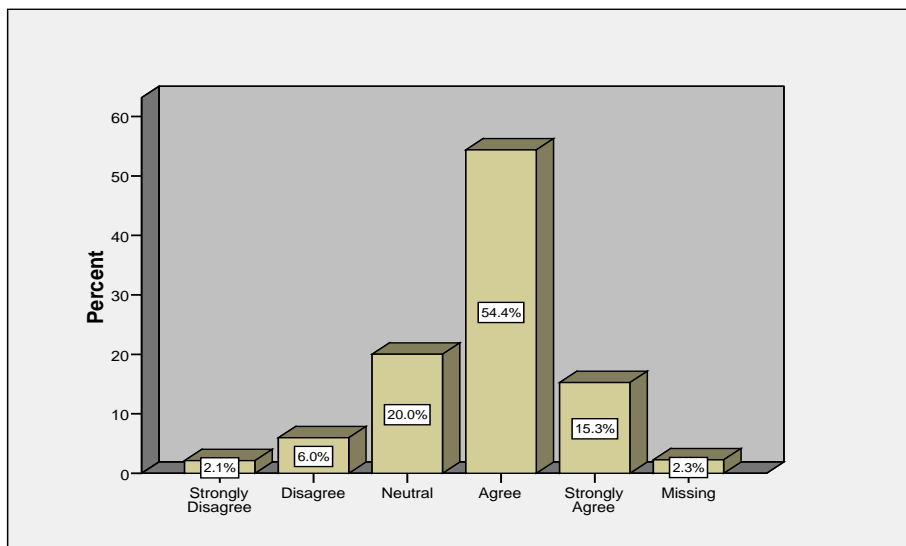
Results indicate that respondents enjoy spending time on lawn care, and consequently the added time that may be required for environmentally friendly alternative practices is not likely to be a significant barrier. This assertion is supported by the question that asked respondents if they would prefer to spend less time managing their lawn than they currently do, where fully two-thirds of respondents indicated either “no preference” or “no” (I would not prefer to spend less

time on lawn care).

Would Respondent Prefer to Spend Less Time on Lawn?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	198	26.3	31.4	31.4
	Yes	219	29.0	34.8	66.2
	No Preference	213	28.2	33.8	100.0
	Total	630	83.6	100.0	
Missing	Don't Know	1	.1		
	Not Applicable	85	11.3		
	Missing	38	5.0		
	Total	124	16.4		
Total		754	100.0		

Respondent's Level of Agreement that they Want their Lawn to Look Good Enough to Fit in With the Community

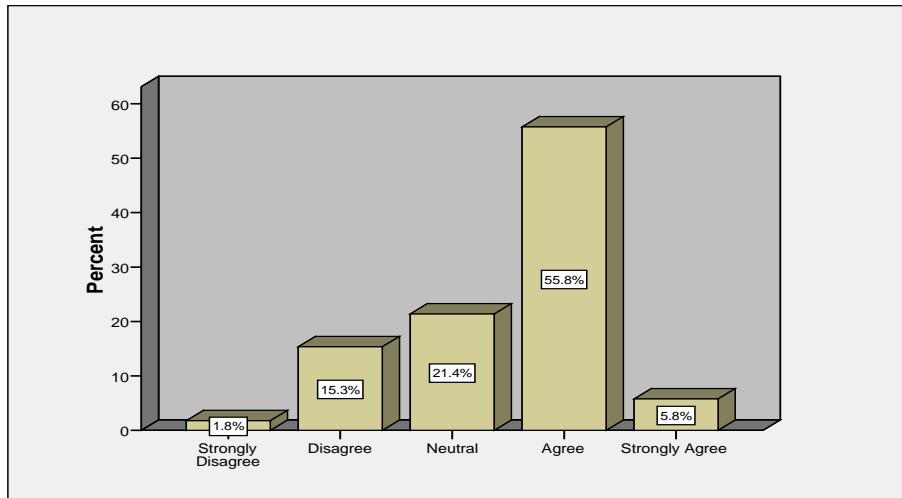


The data also indicate that respondents think it is important that their lawn fit in with their community, which may be especially important for outreach. It may be possible to bring the social norm of an environmentally friendly lawn to the fore of an outreach campaign, and recent research has shown that norm-based appeals to environmental behavior change are far more effective than other framings. While the question of fitting into the community is often conceptualized in terms of lawn appearance, this result is an important one that may be applied to encourage a behavioral change. This finding was reinforced by similar results from a later question in the survey (#9C) that asked respondents' level of agreement with the assertion that Community Members Have a Responsibility to Adhere to Community Standards of Lawn Care; 46.1% of respondents agreed or strongly agreed with the assertion.

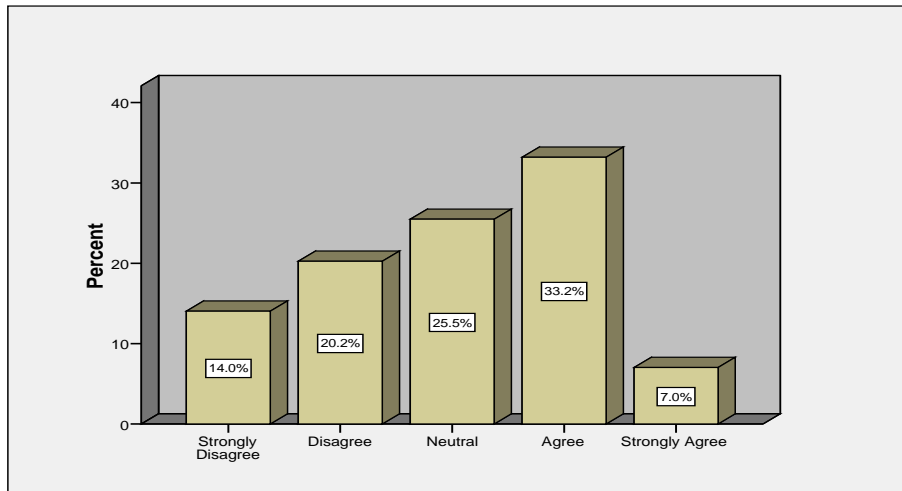
Respondent's Level of Agreement that their Lawn's Main Purpose is to Provide a Space for Recreation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	25	3.3	3.4	3.4
	Disagree	146	19.4	19.9	23.4
	Neutral	243	32.2	33.2	56.6
	Agree	256	34.0	35.0	91.5
	Strongly Agree	62	8.2	8.5	100.0
	Total	732	97.1	100.0	
Missing	Don't Know	1	.1		
	Missing	21	2.8		
	Total	22	2.9		
Total		754	100.0		

Respondent's Level of Agreement that they are Satisfied with their Lawn's Appearance



Respondent's Level of Agreement that Fertilizing is an Important Step to Achieving the Type of Lawn they Want



In addition, a surprising number of respondents assert that their lawns primary purpose is for recreation – a functional, rather than appearance defined standard, and they are satisfied with their lawn’s appearance. Finally, the last chart indicates that respondents agree with the assertion that fertilization is an important step to achieving the lawn they desire.

The next set of questions asked respondents about their lawn care practices, and the data represent a more systematic and direct data collection effort on these issues in New England than is currently available.

Respondent's description of their Lawn Care Practices

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Hire Out the Work	96	12.7	13.3	13.3
	Perform Own Lawn Care	572	75.9	79.1	92.4
	Someone Else Performs Lawn Care for no Fee	21	2.8	2.9	95.3
	Lawn Does not Get Maintained	21	2.8	2.9	98.2
	Do Not Have a Lawn	13	1.7	1.8	100.0
	Total	723	95.9	100.0	
Missing	Not Applicable	1	.1		
	Missing	30	4.0		
	Total	31	4.1		
Total		754	100.0		

Number of Hours per Week Respondent Spends on Lawn Care

	Frequency	Percent	Valid Percent	Cumulative Percent
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Valid	0-1 Hour	187	24.8	30.0	30.0
	2-3 Hours	321	42.6	51.4	81.4
	4-5 Hours	90	11.9	14.4	95.8
	6-7 Hours	15	2.0	2.4	98.2
	8 Hours or More	11	1.5	1.8	100.0
	Total	624	82.8	100.0	
Missing	Don't Know	1	.1		
	Not Applicable	89	11.8		
	Missing	40	5.3		
	Total	130	17.2		
Total		754	100.0		

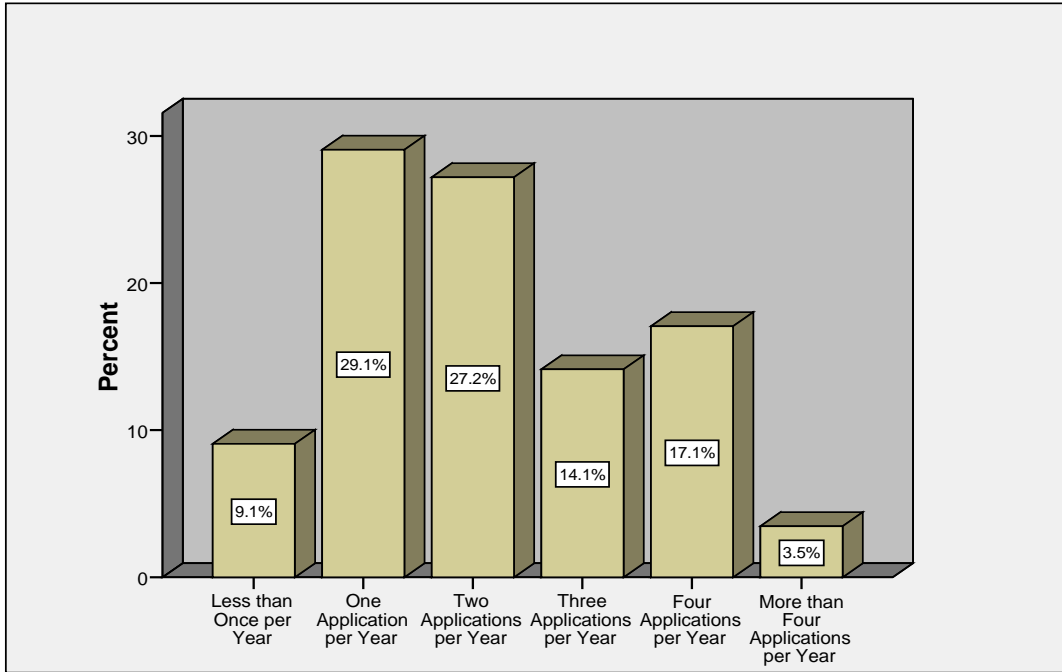
Does Respondent Know the Square Footage of their Lawn?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	399	52.9	55.4	55.4
	Yes	321	42.6	44.6	100.0
	Total	720	95.5	100.0	
Missing	Not Applicable	8	1.1		
	Missing	26	3.4		
	Total	34	4.5		
Total		754	100.0		

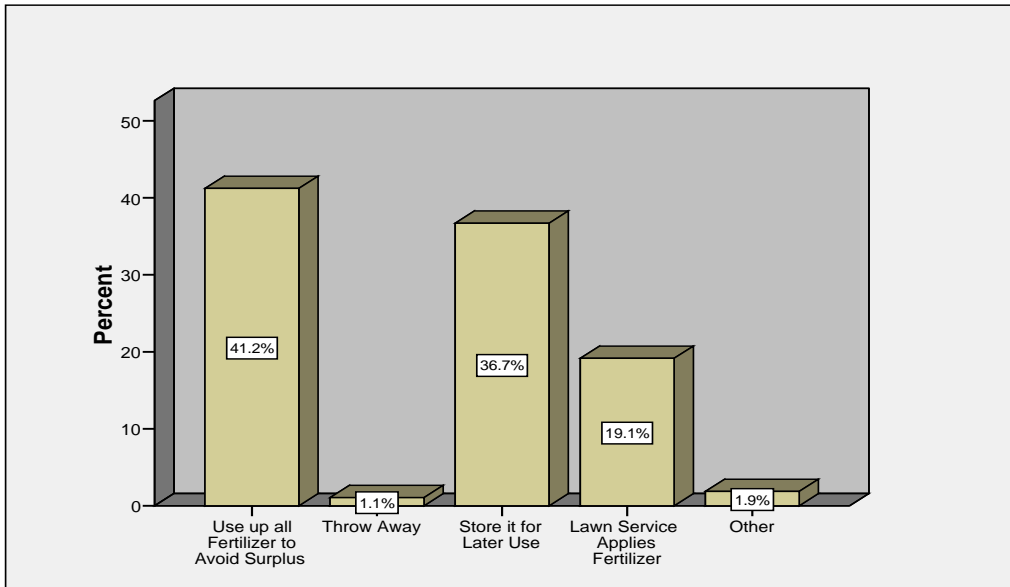
Is Fertilizer Applied to Respondent's Lawn?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	328	43.5	46.7	46.7
	Yes	375	49.7	53.3	100.0
	Total	703	93.2	100.0	
Missing	Don't Know	13	1.7		
	Not Applicable	12	1.6		
	Missing	26	3.4		
Total		754	100.0		

How Often Does Respondent Apply Fertilizer?



What Does Respondent do with Left-Over Fertilizer?

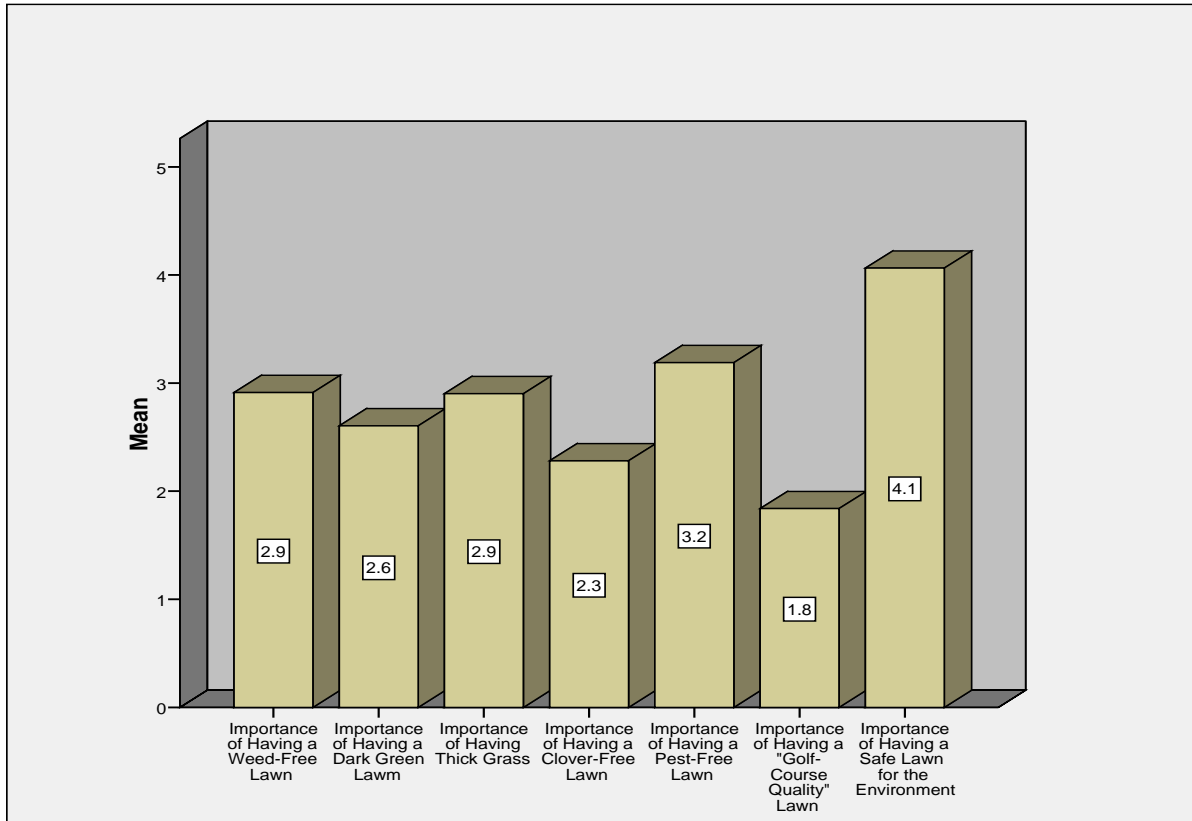


The results indicate that most respondents do their own lawn care for several hours each week, and feel that they know the square footage of their lawn. Surprisingly only about half of respondents indicate that they use fertilizer, with over half of them using fertilizer two times or less per year. More disturbing, however, is the information about what respondents do with leftover fertilizer, as the most common practice is to use an entire package to avoid storage.

Respondents' Lawn Values and Attitudes

The first section of the questionnaire identified respondents' attitudes towards lawn care issues relevant to water quality by asking how important several key issues were to them. The first chart below compares the mean level of importance for each of the issues as perceived by respondents.

Respondents Mean Rating of the Importance of Each Lawn Issue



It is especially noteworthy that of the lawn attributes listed, the most important issue was having a safe lawn for the environment. This again identifies an area where social norms can be brought to bear in an outreach campaign, as simply clarifying the importance of this issue as perceived by fellow community members can be part of a marketing campaign that builds on the latest insights from studies of environmental communications intended to modify behaviors.

Also worthy of note is the fact that there is relatively little importance attributed to the need to have a "clover-free" lawn, which indicates that people may be more tolerant of "mixed" species lawns than is commonly believed. This may be especially important in cases where species such as clover may be able to contribute, through nitrogen fixation, to the necessary nutrients for a healthy lawn.

The two tables below provide more detailed information about the responses to the two questions reviewed above.

Importance of Having a Clover-Free Lawn

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Important	254	33.7	36.5	36.5
	2	120	15.9	17.2	53.7
	Neutral	220	29.2	31.6	85.3
	4	71	9.4	10.2	95.5
	Very Important	31	4.1	4.5	100.0
	Total	696	92.3	100.0	
Missing	Not Applicable	6	.8		
	Missing	52	6.9		
	Total	58	7.7		
Total		754	100.0		

Importance of Having a Safe Lawn for the Environment

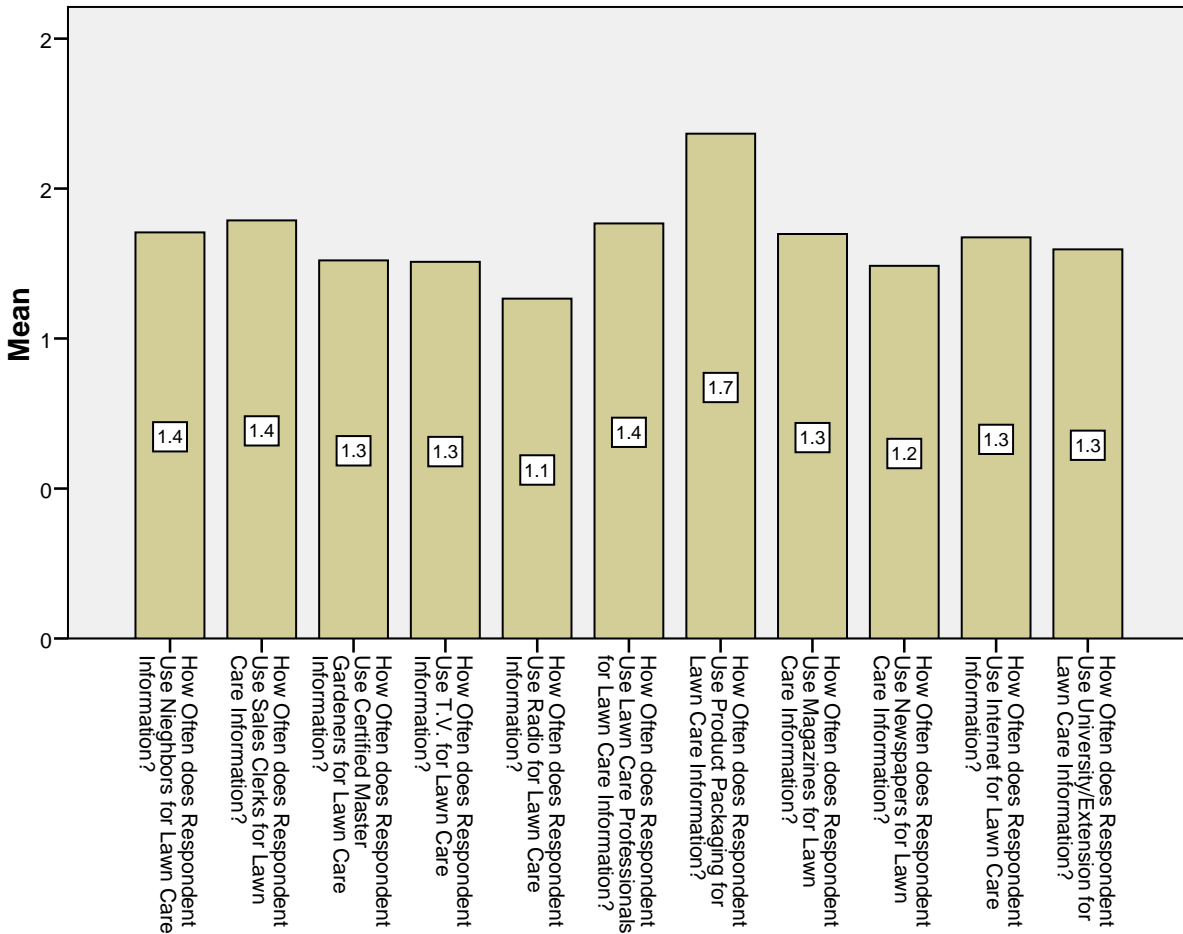
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Important	31	4.1	4.5	4.5
	2	19	2.5	2.8	7.3
	Neutral	107	14.2	15.6	22.9
	4	279	37.0	40.6	63.5
	Very Important	251	33.3	36.5	100.0
	Total	687	91.1	100.0	
Missing	Don't Know	1	.1		
	Not Applicable	8	1.1		
	Missing	58	7.7		
	Total	67	8.9		
Total		754	100.0		

Multivariate analyses have been conducted to better understand the dynamics affecting how important respondents believe a safe lawn for the environment is, and surprisingly there are no significant correlations with political orientation or with fertilizer use. This reinforces the widespread acceptance of this idea, and further suggests that applying the sentiment in an outreach campaign may be appropriate.

Information Sources

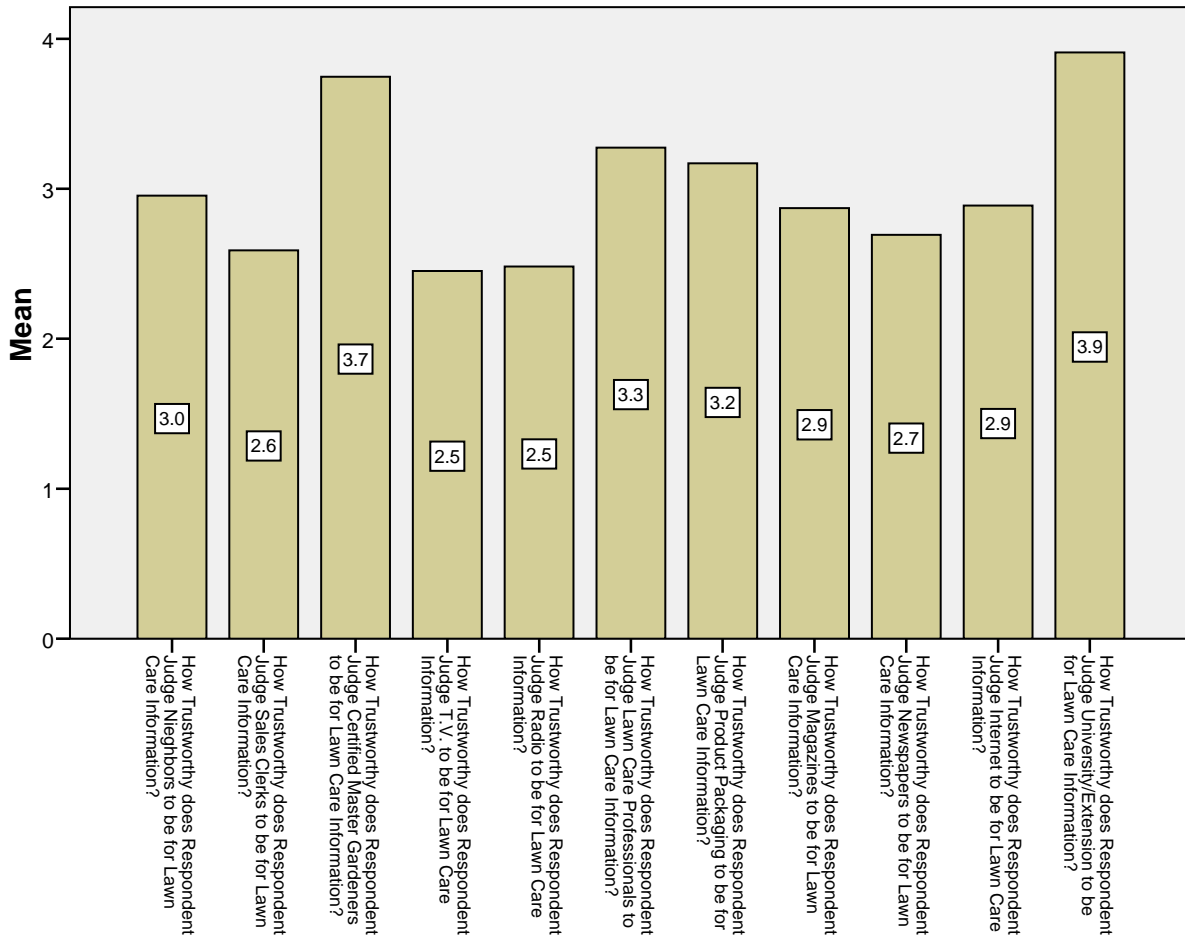
In order to design effective outreach and communication it is important to understand where people get their information about lawn care, and how trustworthy they consider various information sources to be. The information can be used to identify vectors for program delivery and to identify if and where efforts are need to build trust with the general public. The following two charts illustrate respondents’ use of information sources and their level of trust in each.

Respondents Frequency of Use of Information Sources (1=Never, 2=Sometimes, 3=Often)



While all information sources are used, results indicate that the most frequently used source of information about lawn care is product packaging. While other information sources are important, this result does suggest that a point of purchase presence may be an important part of successful outreach. The results also indicate that respondents use master gardeners, university extension, and the internet for collecting information, so existing channels of communication also have a role in future outreach endeavors.

Respondents' Level of Trust in Each Information Source (1=Not Trustworthy, 5=Very Trustworthy)



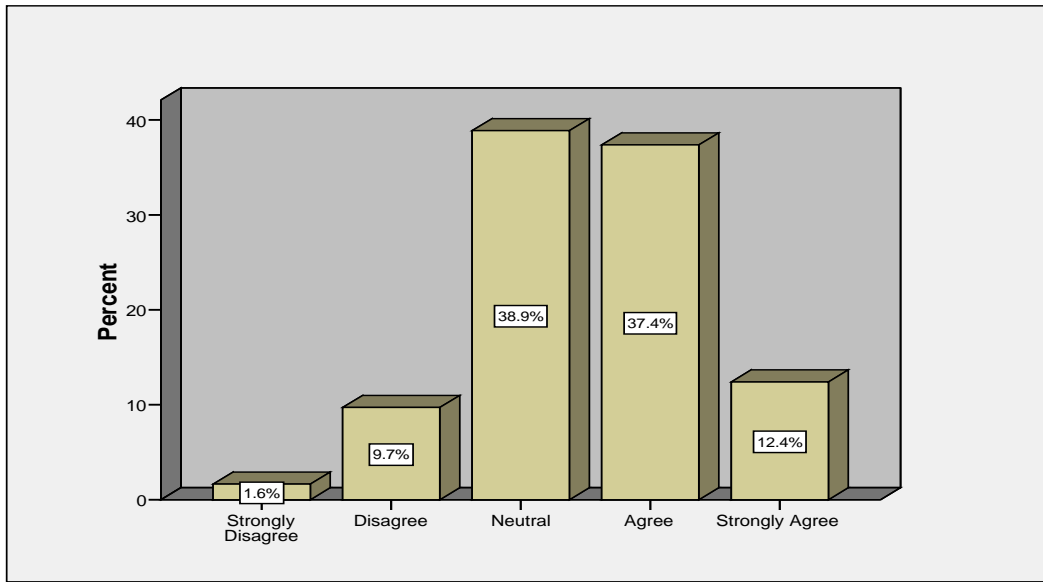
The results above indicate that university extension and master gardeners are considered to be the most trustworthy sources of information. For the development of outreach and education this finding suggests that regardless of the vector of delivery, identifying outreach as extension produced is a wise idea for enhancing credibility. It is also noteworthy that there are relatively high levels of trust in product packaging.

Critical Information Needs

There is not clear understanding of the level of knowledge among members of the general public about several basic information issues related to the relationships between water quality and lawn care practices. Rather than make an informed guess about which of these issues deserve attention, this research seeks to maximize the impact of the limited time available for outreach messages to be heard by collecting data about how well several issues are understood to identify where there is the greatest educational need.

The chart below identifies one of the most pressing information needs: As expected, the vast majority of respondents believe that using organics addresses issues related to fertilizer use and water quality, which is not the case.

Agreement that Using Organic Fertilizers Addresses Water Quality Issues Related to Fertilizer Use.



Agreement that Residential Lawns and Gardens are a Major Source of Pollution.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	11	1.5	1.6	1.6
	Disagree	56	7.4	8.1	9.7
	Neutral	218	28.9	31.7	41.4
	Agree	292	38.7	42.4	83.9
	Strongly Agree	111	14.7	16.1	100.0
Total		688	91.2	100.0	
Missing	Don't Know	21	2.8		
	Missing	45	6.0		
	Total	66	8.8		
Total		754	100.0		

The other important findings from the first section examining critical information needs are the results concerning respondents' beliefs that lawns and gardens are a major source of water pollution. While the subject of the questionnaire may introduce some biases, the results indicate that people are cognizant of these issues. Similarly, responses to the question that asked if respondents recognized that the collective lawn care practices in their community may impact water quality indicate a high level of awareness of that issue. The implication is that these

findings could again be folded into an outreach effort through a focus on the use of social norms in reinforcing communication intended to alter behavior.

The following questions concerned potential information needs related to the use of environmentally friendly alternative lawn care practices. It is possible that people's use of alternatives is likely affected by belief about the costs, time, and other factors associated with these choices. Because of the importance of these factors for the development of outreach to encourage the use of alternatives all five factors examined are presented in tables below.

Agreement that Adopting more Environmentally Friendly Practices will Cost Respondent More Money.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	42	5.6	6.1	6.1
	Disagree	159	21.1	23.0	29.0
	Neutral	239	31.7	34.5	63.6
	Agree	223	29.6	32.2	95.8
	Strongly Agree	29	3.8	4.2	100.0
	Total	692	91.8	100.0	
Missing	Don't Know	16	2.1		
	Missing	46	6.1		
	Total	62	8.2		
Total		754	100.0		

Agreement that Adopting Environmentally Friendly Practices Can Achieve the Type of Lawn Desired.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	7	.9	1.0	1.0
	Disagree	60	8.0	8.7	9.7
	Neutral	299	39.7	43.5	53.2
	Agree	275	36.5	40.0	93.2
	Strongly Agree	47	6.2	6.8	100.0
	Total	688	91.2	100.0	
Missing	Don't Know	18	2.4		
	Missing	48	6.4		
	Total	66	8.8		
Total		754	100.0		

Agreement that Adopting Environmentally Friendly Practices will Take more Time.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	32	4.2	4.6	4.6
	Disagree	177	23.5	25.7	30.3
	Neutral	318	42.2	46.2	76.5
	Agree	144	19.1	20.9	97.4
	Strongly Agree	18	2.4	2.6	100.0
	Total	689	91.4	100.0	
Missing	Don't Know	15	2.0		

Missing	50	6.6		
Total	65	8.6		
Total	754	100.0		

Agreement that Adopting Environmentally Friendly Practices is Important for Improving Water Quality.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	.3	.3	.3
	Disagree	28	3.7	4.0	4.3
	Neutral	157	20.8	22.4	26.7
	Agree	363	48.1	51.9	78.6
	Strongly Agree	150	19.9	21.4	100.0
Total		700	92.8	100.0	
Missing	Don't Know	6	.8		
	Missing	48	6.4		
	Total	54	7.2		
Total		754	100.0		

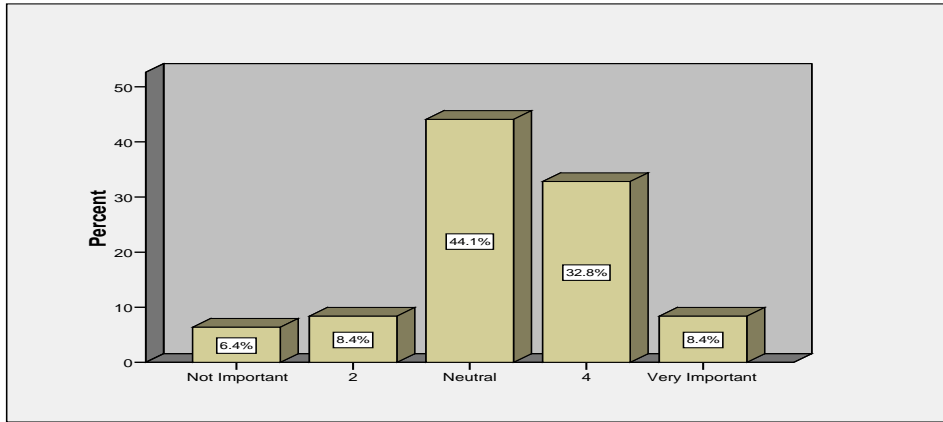
Agreement that the Benefits of Adopting Environmentally Friendly Practices Outweigh Any Costs.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	14	1.9	2.0	2.0
	Disagree	74	9.8	10.6	12.6
	Neutral	263	34.9	37.6	50.2
	Agree	262	34.7	37.5	87.7
	Strongly Agree	86	11.4	12.3	100.0
Total		699	92.7	100.0	
Missing	Don't Know	8	1.1		
	Missing	47	6.2		
	Total	55	7.3		
Total		754	100.0		

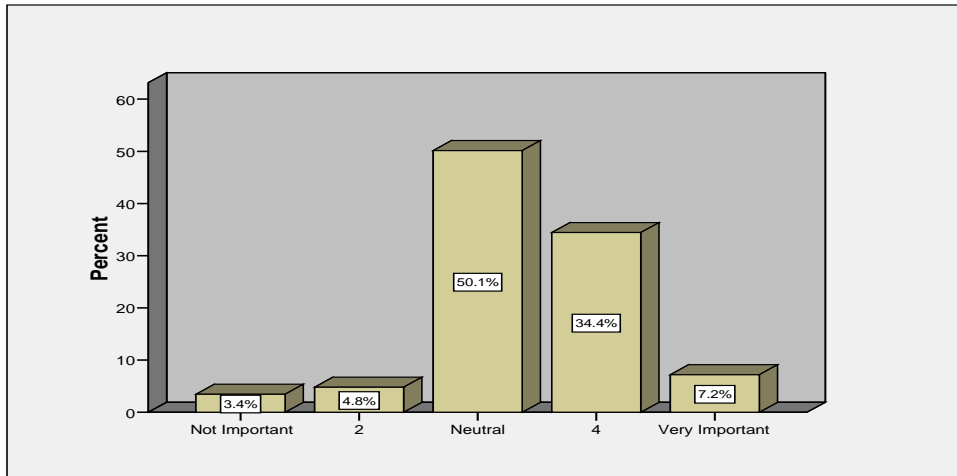
The top charts highlight issues that should be addressed when encouraging alternatives such as cost and the expectations for results, while the bottom two provide more support for the overall likelihood of success in the project. In addition the data could also be folded into a social norm based outreach campaign.

The next section researching information needs and respondents' willingness to adopt environmentally friendly alternatives asked them to identify how important several factors are when deciding to adopt more environmentally friendly lawn care practices. A few very important factors emerged in the data analysis, and the results are presented in the following tables.

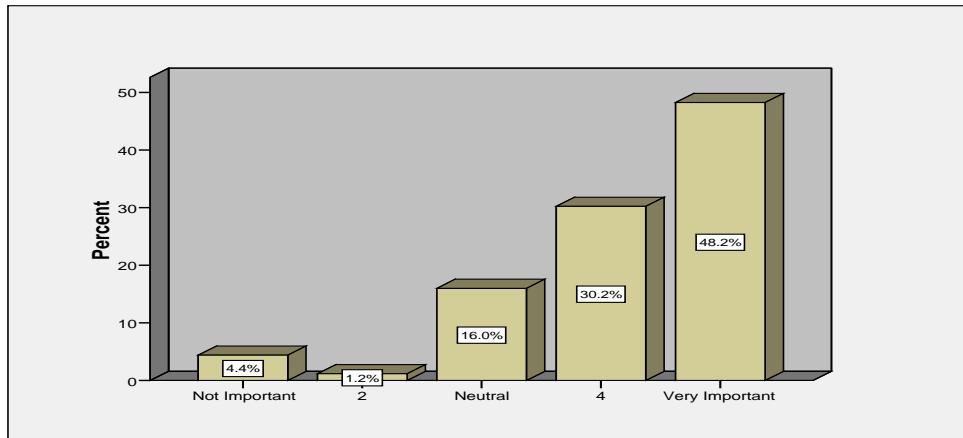
Importance of Having Lawn Look the Same.



Importance of Available Information on Practices.



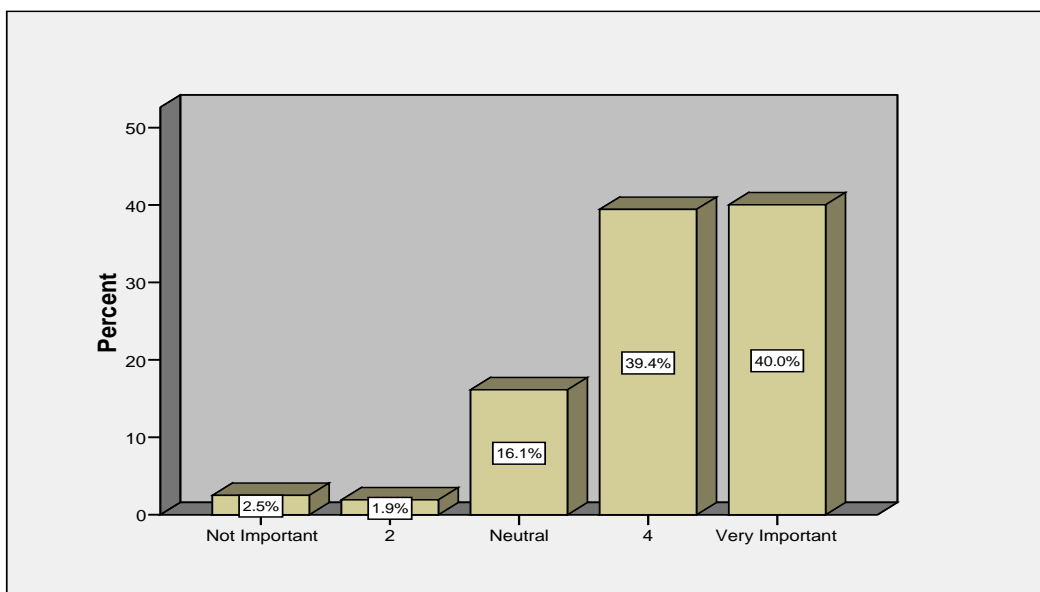
Importance of Protecting Family/Pet Health.



Each of these results identifies an important information need for encouraging the use of environmentally friendly alternatives. First, it is clear that many respondents desire a lawn that looks similar to the way it currently does, and in order to be successful efforts to address the use of alternatives must acknowledge and address this issue openly. The results also indicate that it is very important to provide accessible information on alternatives, as many engaged in lawn care believe the availability of information is essential. Finally, the importance of health issues as a motivating factor for change is one that can be easily incorporated in outreach and education efforts.

It is especially important to note the results conveyed in the chart below, which indicates that respondents believe that protecting a specific body of water is very important in their decision to adopt environmentally friendly alternatives. This finding supports previous research on the power of place and sense of place as a motivator in environmentally responsible behaviors, and clarifies that outreach and education efforts should make a direct link with a specific, local body of water whenever possible.

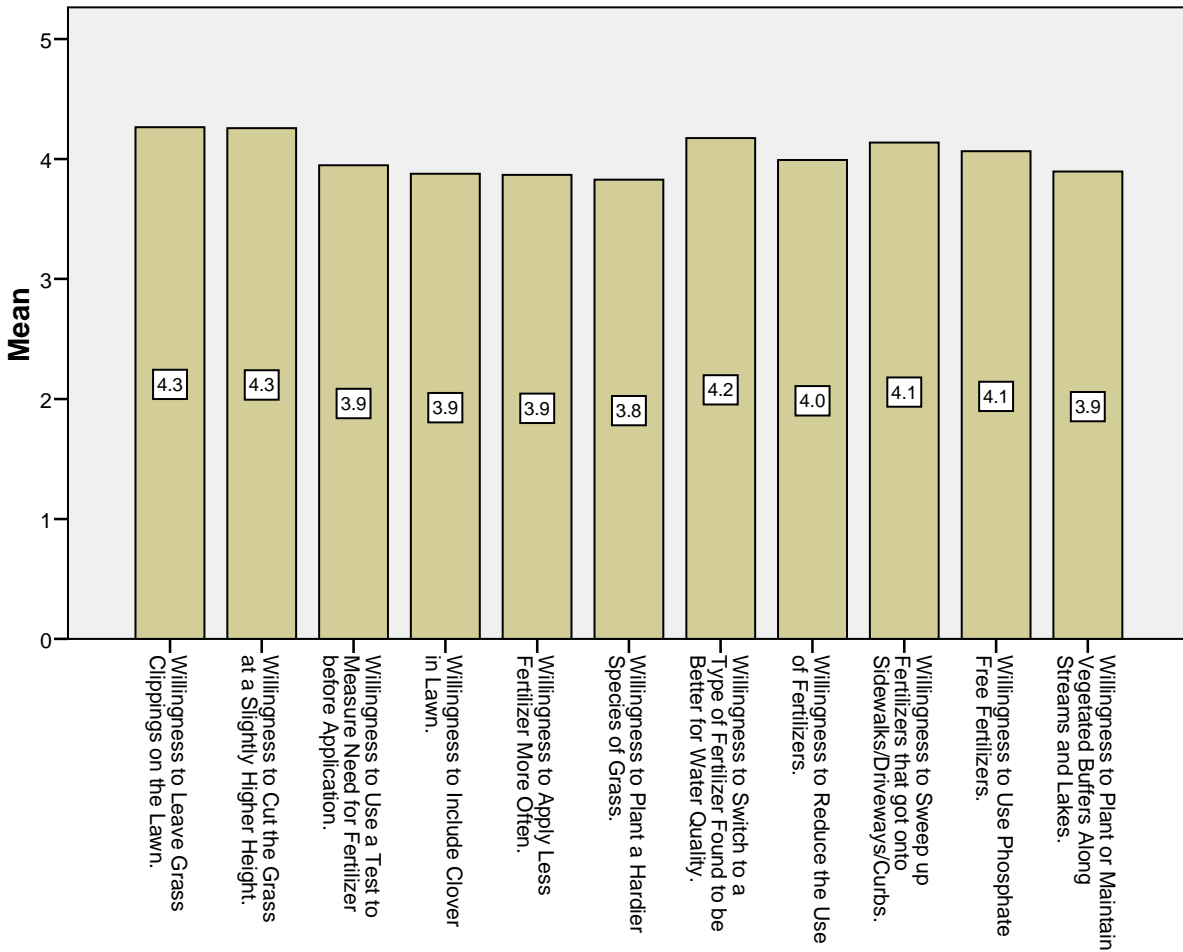
Importance of Protecting A Particular Body of Water.



Willingness to Use Environmentally-Friendly Alternatives

An important question in the survey asked respondents to identify their level of willingness to engage in several lawn care practices to reduce nutrient leaching and runoff from their lawns. The results are summarized in the table below, which represents respondents’ mean level of willingness to engage in each alternative.

Respondents' Mean Levels of Willingness to Engage in Practices to Reduce Nutrient Leaching and Runoff from Their Lawn (1=Not willing; 5=Very Willing)

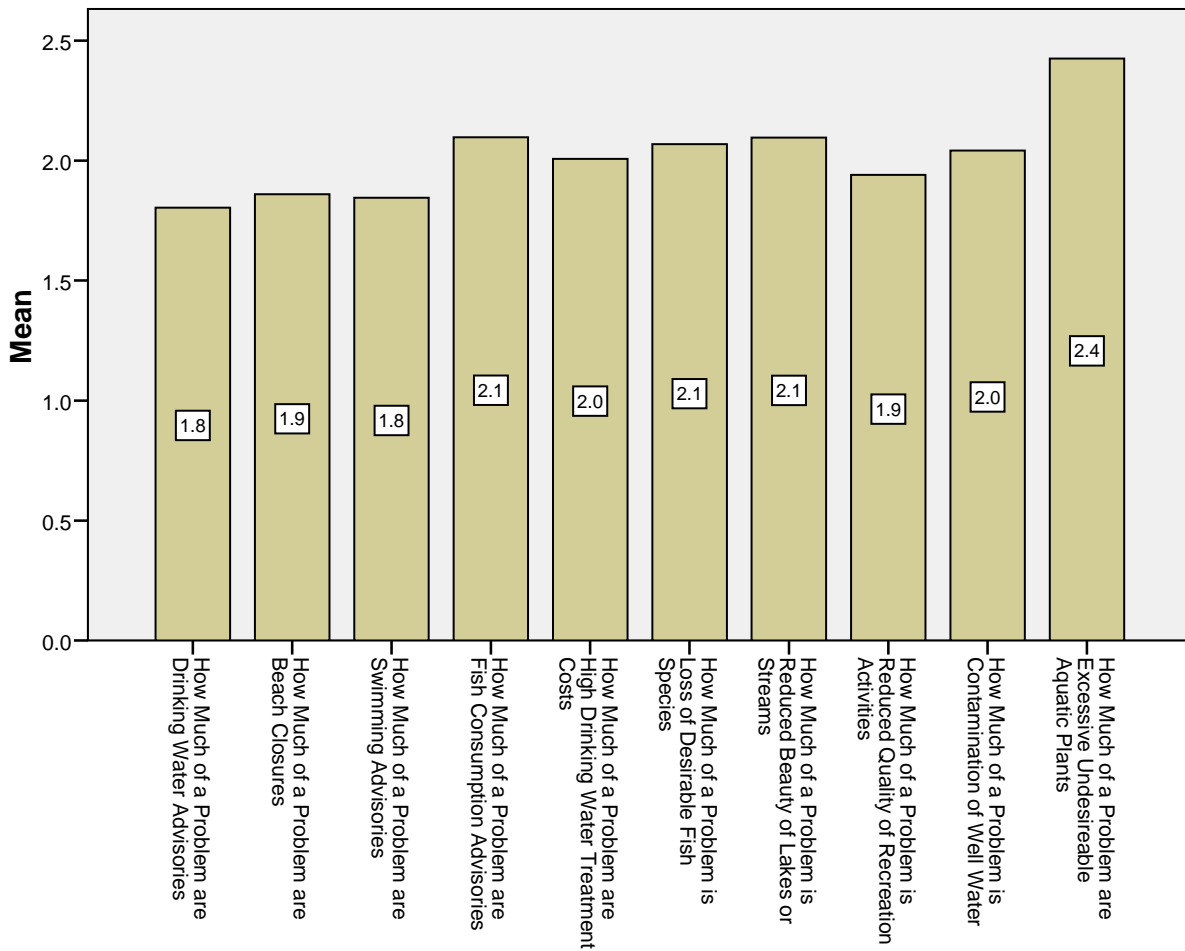


The results are encouraging as they indicate a high level of willingness to engage in alternative practices, but unfortunately the pattern of responses does not identify a particular alternative as particularly acceptable. Overall, the pattern that does emerge is relatively common sense, in that it appears respondents are most willing to engage in practices that alter their current activities the least. That being recognized, there are many alternatives that fit such a description. Further analyses has been conducted using multivariate techniques to better identify the most acceptable alternatives, but no powerful relationships that can specifically direct outreach design have been identified.

Water Quality Issues in Respondents' Communities

The last section of the questionnaire designed to be of use for developing outreach messages asked respondents to identify how severe several specific environmental issues are in their communities. Several of the issues relate directly to water quality, and the results are presented below. The chart below indicates respondents' mean levels of the perceived severity of each issue.

Respondents' Mean Ratings of the Severity of Each Issue in Their Community (1=Not a problem; 4=Severe problem)



The results indicate that none of these issues are perceived to be severe problems, and also that there are few differences across the issues. The well-recognized issue of invasive plant species is the issues of highest concern to respondents, with other results even spread. The implications of this information are that it is likely to be most effective if outreach design is tailored to be place specific in terms of the issues identified as ones addressed by lawn care alternatives. The information contained in the appendix organized in tables showing results for each state can be used to understand and incorporate these variances. For example:

- Drinking water advisories are an issue of high concern in Rhode Island (64.7% of respondents indicates a “moderate” or “severe” problem), but not as severe elsewhere.
- Beach closures and swimming advisories are of higher concern in Connecticut and Rhode Island than other communities surveyed.
- High drinking water treatment costs are relatively high concerns in Rhode Island, Maine, and Connecticut
- The contamination of well water is of most concern in New Hampshire, Rhode Island, and Maine

Finally, it should be noted that respondents from Rhode Island expressed higher levels of concern about each of these issues than respondents from any other state.

Conclusions and Recommendations for the Design of Outreach

Overall the results of the survey can be interpreted as very encouraging for the likelihood of success in outreach programs designed to affect lawn care practices to improve water quality. The response rate of 41% is good for this type of general community survey, and the magnitude of the effort has produced extensive and reliable data on lawn care and water quality issues. Responses were evenly distributed across study sites, with minimal demographic biases that are typical of survey efforts, which in this case may actually result in information more accurately describing those residents actively engaged in lawn care.

Respondents indicated that lawn care and the appearance of lawns are important to them, but also that they recognize some environmental concerns exist and they are very willing to explore alternatives to address those issues. Several important results emerged in the analysis that are of use for designing outreach, and are highlighted in the recommendations below.

Finally, it is important to note that the high quality of this effort is the result of the time, dedication, and thoughtful input from the project team as a whole. The CSREES integrated program is designed to foster truly interdisciplinary work, which is well-represented in this effort. The project team from the Center for the Environment at Plymouth State University acknowledges the critical contributions of all involved, and thanks each member of the project team for their efforts and positive attitudes.

Recommendations for the Design of Outreach

Specific Content of Messages

The following identify key information for inclusion in outreach messages as indicated by survey results:

- Using organics does not address water quality issues related to fertilizer use, but 49.8% of respondents believe that it does.
- Fertilizer impacts water quality (basic information, particularly on the dynamics of the processes, are still needed)
- 30.5% of respondents believe their work or business is economically dependent on the quality of their watershed
- Don't use it all: 41.2% of respondents reported they use all fertilizer purchased to avoid storage
- Protecting family and pet health is important or very important to 78.4% of respondents, so links between over-fertilization and these concerns could be a motivating element of outreach messages.
- Respondents are very accepting of several simple practices: 1) using fertilizers that expressly protect water quality; 2) cutting grass a higher height, and 3) leaving clippings on the lawn. Similarly, respondents indicate that it is not important that a lawn be clover-free (53.7% rated a clover-free lawn as a 1 or 2 on a 5 point scale of importance). These basic steps are the most widely acceptable alternatives, and therefore may be productive to recommend.

Framing Messages: Knowing the Audience and Using Social Norms

Understanding the intended audience in depth is a central feature of community based social marketing approaches, and important factors for consideration are highlighted below.

- *The Audience: Key Considerations*
 - Time considerations are not identified as a major factor in adopting environmentally friendly alternatives - two-thirds of respondents (65.2%) do not indicate a desire to spend less time on their lawn or have no preference for doing so.
 - Nearly half (47.9%) of respondents assert they enjoy spending time on lawn care.
 - “Spoon feeding” approaches may be a viable suggestion based on this information.
 - 76.9% of respondents assert that it is important that their lawn look the same as it currently does if they adopt environmentally friendly alternatives and only a small portion of respondents (9.7%) believe alternatives cannot achieve the type of lawn they desire. There appears to be debate among turf scientists on this issue, and it should be acknowledged and explicitly addressed to prevent unrealized expectations.
 - Linking the impacts of over-fertilization on water quality with a specific body of water is essential. 79.4% of respondents rated that framing as important or very important when considering their own actions, so tailoring messages to create such specific links should be undertaken whenever possible. It is worthy of note that this finding supports a long line of research on the importance of place attachment and identity on stimulating environmentally responsible behaviors.
 - The availability of information on alternatives is important to many respondents for them to consider adopting them (41.6%). Outreach should be succinct, but should clearly identify sources of additional information.
 - Concern about specific environmental issues varies across the region, so messages intending to incorporate claims about the severity of issues should be tailored to specific regions.
 - Most respondents are satisfied with their lawn’s appearance, and only 40.2% agree or strongly agree that fertilization is important for achieving the lawn they desire. Only 53.3% of respondents state they use fertilizer on their lawn, and 65.4% of fertilizer users assert they apply product two times per year or less. 20.6% of respondents indicate they use fertilizer 4 or more times per year.

Extensive research, which is supported by findings from this study, concludes that messages using socially normative framings (rather than “scare tactics” or conscience appeals) are especially powerful for motivating environmentally responsible behavioral change.

- *Using Social Norms: Potential Messages*
 - “Fitting in” is important to most respondents: 69.7% agreed or strongly agreed that they want their lawn to look good enough to fit into their community; 46.1% agreed or strongly agreed with the assertion that community members have a responsibility to adhere to community standards of lawn care.

- ***an important implication is that the data can be used to redefine the lawn care norms of a community to include considerations of water quality impacts***
- 30.5% of respondents believe their work or business is economically dependent on the quality of their watershed
- When asked about what features of a lawn are most important, the most common response was that lawns be safe for the environment. This could be framed as: “In a recent survey of neighbors in your community 77.1% believe that having a lawn that is safe for the environment is important. Your neighbors assert that environmental safety is just as important as a lawn’s appearance.”
- Similarly, 73.3% of your neighbors responding to a recent survey agree or strongly agree that adopting environmentally friendly lawn care practices is important for improving water quality.

Message Delivery

- Results from both the survey and interviews indicate the timing of the messages is important, as this is not a topic that is frequently considered outside of the moments where lawn care decisions are made or activities undertaken.
- As expected, the most commonly used source of information on lawn care is product packaging. This reinforces that a point of purchase effort may be essential for success.
- Media sources are not widely used or trusted.
- Master gardeners and University Extension are considered the most trustworthy information sources by far, so being clear about affiliations and providing additional sources of information associated with these groups is useful and appropriate.

Eisenhauer, B. W. and B. Gagnon. 2008. "Changing Homeowner's Lawn Care Behavior to Reduce Nutrient Losses in New England's Urbanizing Watersheds: The report of findings from social science research." USDA CSREES project # 2006-51130-03656.

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