

AN ABSTRACT OF THE THESIS OF

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Applying Social Science Towards the Reduction of Nutrient Losses From Lawn Care Practices in New England: Advancing the Principles of Community Based Social Marketing

New England is experiencing high rates of land conversion from traditionally rural land uses to residential and commercial development. Landscapes once dominated by forests and agriculture are now being subdivided and converted into “exurbs”. Along with this style of urbanization comes an increase in the amount of managed turf, or lawns, in the landscape. Lawn care has been identified as a major source of non-point pollution that is a contributor of excess nutrients in many water bodies, both coastal and inland. Despite concerns with algal blooms, hypoxia and a host of other water pollution concerns related to nutrient losses from turf management there have been relatively few changes in home lawn fertilization practices over the past 30 years. A multi-state, interdisciplinary team comprised of environmental scientists, social scientists and Cooperative Extension members was formed to develop an outreach and education program that will reduce the amount of nitrogen and phosphorous from lawn care that is a major source of pollution in many of New England’s urbanizing watersheds. To achieve project goals social science research using 52 in-depth interviews with turf care experts who work with the public and a random sample survey of New England residents was used by the interdisciplinary team to understand the current drivers of today’s lawn fertilizing practices. Social science provides a valuable perspective for developing effective means for changing behaviors affecting non point source pollution from lawns. Using the principles of Community Based Social Marketing and a modified form of the Theory of Planned Behavior as a framework to guide research and the production of outreach, the findings reported here indicate that sources of information used by people performing lawn care are not entirely aligned with their needs and goals. This document reports these findings and the specific outreach messages developed from them that can be used to reduce lawn care pollution in New England.

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Applying Social Science Towards the Reduction of Nutrient Losses From Lawn
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Social Marketing

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I understand that my thesis will become part of the permanent collection of
Plymouth State University, Lamson Library. My signature below authorizes
release of my thesis to any reader upon request.

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DEDICATION

I dedicate this thesis to my unendingly supportive family and to my very good friend and advisor Dr. Brian Eisenhauer, both of whose patience and commitment to my education has turned this goal into a reality.

I sincerely thank you.

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Applying Social Science Towards the Reduction of Nutrient Losses From Lawn Care Practices in New England: Advancing the Principles of Community Based Social Marketing

Chapter I Introduction to the Study

1. Introducing the Issues and Approach

A good deal of legislation has been aimed at managing industrial point sources of water pollution over the past few decades. The creation of the Federal Water Pollution Control Amendment, Clean Water Act, and Water Quality Act as well as other regulation gives governing bodies a means for managing point sources of pollution. This legislation has been met with a level of success, yet watersheds all across the country are repeatedly failing to meet the minimum standards needed to be considered unimpaired. Part of the issue is related to the fact that experts have acknowledged a shift in sources of water pollution. Although point source pollution still plays a significant role in many impaired aquatic systems, the presence of non point source pollution (NPS) has gained the notoriety of being a substantial source of water quality degradation. The United States Environmental Protection Agency (EPA) now describes non point sources of pollution as being “the largest source of water pollution today” (EPA “Managing Nonpoint Source Pollution from Households” 2008). The United EPA describes non-point source pollution as follows;

NPS pollution, unlike pollution from industrial and sewage treatment plants, comes from many diffuse sources. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water. (EPA, 1994. “*What is Nonpoint Source (NPS) Pollution? Questions and Answers*” EPA-841-F-94-005)

Unlike point sources of pollution, the origins of NPS are diverse and often mundane and can truly be considered the hidden cost behind many of our everyday activities. Due to this fact, pollution from non-point sources cannot be controlled simply through broadly focused legislation or by managing industrial and commercial discharge from individual facilities. A USDA, CSREES funded grant project targeting five New England states (Maine, New Hampshire, Vermont, Rhode Island, Connecticut) will allow for the advancement and implementation of new techniques for reducing the damaging effects of this specific form of NPS in from lawn care, and supports this research.

NPS pollution is directly related to how the land is used by everyone who occupies it. Strategies to address non-point issues must accommodate not only the often politically sensitive large scale issues of land-use planning and zoning, but also efforts aimed at convincing people at the individual level that this issue exists and as part of this problem they should be compelled to take action by altering behaviors. Due to the commonplace nature of many behaviors linked to non-point-source pollution it is likely that people who would otherwise act in more environmentally responsible ways are unknowingly contributing to this growing problem. Some that acknowledge their connection to these issues justify their role

as being a minor one given the scale of their actions relevant to the landscape, and thus consider the consequences of their individual actions as insignificant. Still others may simply exhibit low levels of environmental concern, placing a greater level of importance on maintaining and continuing their current lifestyles. Given the challenging, dispersed nature of NPS and the related issues that need to be addressed to deal with the problem successfully, new interdisciplinary approaches must be developed to address the issue at the individual, as well as at the legislative level.

Social science provides an effective means for designing outreach aimed at changing behaviors to reduce the presence of non-point source pollution in watersheds. Utilizing applicable theory and theoretical modeling social science can provide an advanced understanding of the driving factors behind behavior linked to the presence of NPS. Understanding the social underpinnings of behavior allows for the creation of messages with themes that will resonate throughout identified target audiences and affect knowledge and behaviors related to NPS issues. In addition the application of sound Community Based Social Marketing (CBSM) techniques (McKenzie-Mohr, Smith 1999) enables researchers to identify influential vectors of information delivery that will increase relative trust in and exposure to messages. This study exemplifies the benefits of using well supported social science to develop guided outreach and education efforts in reducing the presence of nitrogen and phosphorous non-point-source pollution from lawn care practices.

1.1 NPS: The Everyday Pollution

Non point sources of pollution exist in many forms in our society, the collective impacts result in serious economic and health issues as well as expensive and sometimes irreversible water quality problems. Some of the more prominent NPS related activities are the result of many diverse yet common aspects of society and land uses, including construction and other earth moving activities (EPA “Erosion, Sediment and Runoff Control for Roads and Highways” 2008). These can increase the amount of soil erosion carried by precipitation greatly increasing the amount of sediment in water bodies. Wetlands are filling in with sediment, destroying habitat for fish and other aquatic flora and fauna. Excess sedimentation also clogs storm drains, culverts and other drainage related infrastructure, costing state and local governments a good deal of money in order to maintain adequate drainage. Nutrients (phosphorous) cling to sediment, compounding the contamination effects of the excess sediment. (Salwen and Stacks 1997; Goldberg et al.1997).

Road maintenance is also of concern as a source of NPS. The application of sodium chloride during winter maintenance contaminates waters, impacting aquatic life. Even low concentrations of sodium chloride have been shown to harm plant species that comprise the foundation of aquatic food chains. Roadside snow collects and later transports oil, exhaust, and metals from automobiles.

If not properly maintained septic systems may back up and fail, allowing pathogens and nutrients to infiltrate ground and surface waters contaminating local

lakes, ponds and streams as well as personal well water. Poisons from agricultural products such as insecticides, herbicides, and fungicides will often migrate into water bodies or leach into soils. This brief list of sources and issues, while not all encompassing by any means, exemplifies the complexity of NPS issues.

In addition to these important NPS issues, turf management practices have been identified as an important component of non-point-source pollution. Lawn care strategies that incorporate the use of fertilizers are of special concern, as fertilizer use has been identified as a significant contributing factor to declining watershed health (Xu, Baker, and Johnson 2007). Nutrient loading resulting from the migration of excess nitrogen and phosphorus applied as part of a turf management strategy are contributing to the occurrence of eutrophication leading to Cyanobacteria (blue –green algae) blooms. These algal blooms have created thick mats of scum that at times can release harmful neurotoxins, while decaying blooms reduce levels of dissolved oxygen otherwise know as hypoxia, leading to losses in both desirable fish and plant species. Of concerns linked to N and P, phosphorous is limiting nutrient in fresh water systems, while nitrogen is limiting nutrient in salt water. The increase of these nutrients dramatically increases the presence of the issues discussed above. While this is not a complete list these are the major issues of concern that this project seeks to address.

Research has shown that the negative effects of NPS reach beyond the ecology of the water systems and into other aspects of everyday life. Many areas of New England are rich in natural amenities, making the region a desirable

destination for visitors of all types. Many regional economies are largely dependent on the seasonal influx of revenue linked to natural amenity based tourism.

Research suggests that the economic draw of a region weakens as opportunities for enjoying these pristine settings diminishes in the face of reduced environmental quality (Nordstrom 2007). Increased turbidity and odor impacts the aesthetic quality of impaired water bodies essentially reducing opportunities for recreational activities that bring people in contact with the water, such as swimming or water skiing. Lower levels of dissolved oxygen reduce populations of desirable sport fish species, impacting non-contact and consumptive recreation opportunities as well.

The economic impacts of poor water quality do not end at the shoreline. Waterfront and surrounding property values drop as the area around a polluted water body becomes less desirable. Illustrating this issue is a study conducted by the University of Maine along with Maine's Department of Environmental Protection (Bradley et al.1996). This research describes the strong link between local economic losses and the reduced quality of lake water. In a survey that focused on answering the question "What factors influence visitor's choices regarding which lakes and ponds they recreate on" 70% of those surveyed listed water quality as being very important. When studying the likelihood of long term investment researchers found that over 51% of current waterfront residents took water quality into consideration prior to purchasing homes and property. This study also reveals a direct correlation between water clarity and property values. Researchers

discovered that for every three feet of reduced visibility in a lake's water the surrounding property values declined by 10-20% (Bradley et al.1996).

The quality of water in a watershed experiences elevated levels of pollution when introduced to an increase in anthropogenic activity (Ahern et al. 2005). This activity can take many forms ranging from logging and mining practices to an increase in traffic volume. The increase in anthropogenic activity affecting the focus of this research is an increase in development and population size in a given area. Research has found that the greatest impact on water quality occurs when land transitions from very little development or urbanization, such as in a rural setting, to a moderate degree of development. Developing previously rural regions increases the area that new buildings, impermeable surfaces, and turf occupy. Research has also shown that the ability of these once forested lands to sequester excess nutrients is greatly reduced once the land becomes developed. In fact undeveloped forested land has been found to contribute 40 times less phosphorus to Vermont's Lake Champlain than developed land (LCLT "Phosphorus and Lake Champlain" n.d.). The combined effects of increased nutrient loading from turf and the lands reduced ability to sequester them result in the emergence of water quality issues.

This assertion is especially relevant to rapidly urbanizing rural watersheds across New England. All New England states have shown a population increase over the last 15 years (USDA CSREES Lawn Care Grant Proposal # 2006-51130-03656). Although the general population growth could be described as being rather

modest when compared to other areas of the country, the nature of this growth has profound implications for water quality issues. Census research shows that New England's metropolitan and highly urbanized areas have seen a slight population decline, whereas more rural regions are experiencing growth rates that are 20% greater than recorded in the previous decade. This shows that rural acreage previously dominated by regulated commercially focused and forested lands have taken the brunt of this development. Compounding rural water quality issues even further is the uneven distribution of this development. Much of this new development is drawn to bodies of water increasing the chance of negative impacts. When describing the urbanization of coastal watersheds The Nature Conservancy of New Hampshire reports that:

Over the past 36 years, in Rockingham and Strafford Counties, an average of 2,230 acres per year has been converted from undeveloped land to a developed condition. And there is no indication that the pace of development will slow in the foreseeable future. (Ng, The Nature Conservancy. 2009 "A Land Conservation Plan for New Hampshire's Coastal Watershed" WEBSITE accessed March 9, 2009)

The urban sprawl model of development in previously rural New England regions transforms large tracks of land into subdivided residential properties. These once large, singly owned tracks often lose their tradition of stewardship when properties are subdivided into smaller residentially focused developments, as this new pattern of land usage now involves many owners exhibiting a wide variety of interests, values, attitudes and connections to the land. The negative impacts of suburban sprawl on the environment are numerous and well known within a variety

of professional and academic realms (Radeloff, Hammer and Stewart 2005; Wang and Moskovits 2001; Jun, Zong-Guo, Clarke and Frei 2007). The single family structures typical of suburban development house less people over larger areas of land than in urban settings, dramatically increasing individuals, ecological footprint. Increased distances between residents' home, work, and urban centers combined with a widespread lack of public transportation necessitate individual use of automobiles. Developing previously forested and natural settings fragments viable wildlife habitat. The amount of impermeable surface is greatly increased preventing precipitation from entering the earth and recharging groundwater, but instead forcing flow over land to collect and transport a plethora of pollutants and sediment to untreated storm water outlets. Populations typically inhabiting these settings usually fall into upper socio-economic classes and often lead more affluent lifestyles, and the dominant model of development includes the establishment of uniform turf grass as a defining feature of the suburban landscape (Robbins, Polderman, Birkenholtz 2001). As a result it is not surprising to learn that as urban sprawl displaces other forms of land coverage so too does the area of monocultured, intensely managed turf also known as lawns, which bring with them many NPS issues (Robbins, T. Birkenholtz 2003).

1.2 Lawns and NPS

To best develop efforts to address problems, the dynamics must be understood in detail, and the focus of this study will be on an especially important

issue: the social dynamics affecting fertilizer use as a contributor to water quality degradation. The inclusion of the lawn in residential landscapes brings with it a number of potential environmentally harmful activities such as the misapplication of fertilizers, and pesticides. The individual's carbon footprint is also increased with the use of heavily polluting lawn care equipment. Equipment of this kind can be so polluting, in fact, that operating a gasoline powered leaf blower for one half hour produces as many hydrocarbon emissions as does driving a car for 7,700 miles at thirty miles per hour (Steinberg 2005). This figure only tells part of the environmentally tragic story involving the "successful" use of fuels used to power lawn maintenance equipment. It has been estimated that while filling power equipment Americans spill a collective 17 million gallons of fuel per summer (Steinberg 2005). While this is certainly not an all encompassing list of the environmental hazards linked to lawn care, it does clarify the breadth of the issues involved.

Both nitrogen (N) and phosphorous (P) are considered limiting nutrients in aquatic systems, and regulate flora, and perhaps more importantly, micro-flora propagation. Nitrogen is known to have this role in estuaries and other salt water environments while phosphorous is a key factor in fresh water systems. Both nutrients comprise the leading active ingredients found in turf fertilizers and both are also found in residential runoff. While there are certainly other anthropogenic sources of excess nitrogen and phosphorous linked to population growth and land development patterns, fertilizer use in turf management strategies have been

identified as being a major contributor (Xu, Baker, and Johnson 2007; Wong, Chan, and Cheung 1998).

The danger of losing nutrients from turf management practices is greatly enhanced when an excess of nutrients is present in the soil. Do-it-yourselfers (DIYers) of home lawn care can create this excess in their lawns through the over application of fertilizer. Although N and P leachate can originate from both organic and synthetic fertilizers, it is the project team's basic assumption that most home fertilizing is done with the bags of synthetically produced fertilizer being sold at big box and local home and garden outlets. Synthetic fertilizers are chemically processed and designed to contain concentrated quantities of water soluble nutrients in order to be immediately available to the plant. The problem with the water soluble nature of synthetic fertilizer is that whatever amounts are not quickly used by the turf are often carried off site by watering the grass or by naturally occurring precipitation events. It is easy to recognize the danger posed to water quality due to over application of fertilizer, yet over application may be a common mistake made by DIYer populations.

A compelling argument can be made for the important role homeowner decisions, knowledge, and perceptions play in the dynamics of lawn NPS by examining a simple finding from the qualitative data gathered during this research. A series of 52 in-depth interviews aimed at gathering qualitative data from experts involved in the turf industry across New England revealed a good deal about the lawn care practices of those who perform their own lawn care and the issues they

ask experts about. For example, a question frequently asked of these experts was “How many bags of fertilizer should I apply to my lawn?” This question typifies the view repeatedly expressed by experts that among do-it-yourselfers a lack of knowledge exists regarding many aspects of lawn care. Units of fertilizer applied as part of a turf management strategy are usually expressed in units of pounds of nutrient (N and or P) per acre or per 1000 square feet or other appropriate measurements for a given area. DIYers inquiry regarding the “bags per lawn” exemplifies the lack of sophistication among DIYers that may contribute to fertilizer over application.

A major confounding dynamic affecting DIYer’s knowledge of links between fertilizer use and water quality is that techniques for determining the proper timing, amounts, and necessity of applying fertilizer have evolved very little over the past few decades. Nitrogen and Phosphorus are still applied on a routine basis, usually three to four times per year as recommended by manufacturers, without testing whether or not the soil actually lacks sufficient levels of nutrients. There are many more issues, but these examples demonstrate the complexity of the issues related to DIYer turf care that effect water quality.

1.3 Explaining the Need for Outreach

The traditional approach to fertilizer use greatly increases the likelihood of over application. Concerns over nutrient losses have even prompted a ban on P containing fertilizers in some sensitive areas, but as a whole the issues have not

been successfully addressed. Part of the reason the project reported here has formed an innovative and collaborative approach between the social and environmental sciences was to develop regionally specific appropriate fertilizer recommendations. Developing these recommendations, as well as an objective soil nitrate test, will provide DIYers with scientifically supported and current fertilizer recommendations that may reduce this source of NPS and still meet homeowners' lawn related expectations. Delivering this information through empirically researched vectors utilizing compelling messages can be applied to alter the tradition based reasoning many DIYers base their fertilizer application decisions on.

The need for increased public exposure to this knowledge is unfortunately already apparent. A number of water bodies throughout New England provide clear examples of the cumulative effects of excess nitrogen and phosphorus. Vermont's Lake Champlain serves as a high profile example. This lake is highly valued for its recreational opportunities, however the drinking water supply and scenic beauty is now impaired as it experiences seasonal blue-green algal blooms. These algal blooms have created thick mats of scum that at times release harmful neurotoxins. The presence of elevated levels of cyanobacteria have been linked to the deaths of family pets after ingesting the poisonous water, skin irritation in humans caused by contact, and the deaths of large numbers of fish and other aquatic species including many water fowl (LCLT "Phosphorus and Lake Champlain" n.d.). The Lake Champlain Land Trust cites 80% of the lake's excess P as originating from non

point sources, and describes this type of pollution as being dispersed and more difficult to control than point sources of P (Meals, Lenore 1998; LCLT "Phosphorus and Lake Champlain" n.d.). The area's recreation based tourism is largely centered on the use of Lake Champlain, and in the Lake Champlain Valley generates over 300 million dollars annually for the region. Clearly this pollution poses substantial ecological and economical threats to the region and the state.

Similarly, New Hampshire's Great Bay Estuary is also considered by many organizations to be at risk due to the rapid increases in development and population gains. Over the past 20 years New Hampshire's seacoast region has experienced a growth in population that surpasses all other areas of the state. In one of the fastest growing counties in New Hampshire's seacoast region 34.3 % of rural land was converted to residential land use between the years 1967 and 1998 (USDA CSREES Lawn Care Grant Proposal #2006-51130-03656) and future projections calculate even greater rates of conversion to come. Compounding the water quality issues posed by population increases is the rate of land being converted per individual. As previously discussed, suburban sprawl often carries a tradition of inefficient land use. Telling figures suggest this is the scenario occurring over much of New England's coastal areas. A report by the U.S. Geological Survey describes an increase in the amount of developed acreage per individual.

Between 1953 and 1974, 0.75 acres of land were developed in Rockingham County for each person added to the population. Between 1974 and 1982, this rate of land consumption more than doubled to 1.59 acres per capita. The dispersed land use pattern this creates is reflected in a comparison of population growth to traffic volume in the region. From 1982 to 1997 population in Seacoast

New Hampshire grew by about 38%, while traffic volume in the region grew by 169% a factor of more than 4 to 1! (2003-2022 Long Range Transportation Plan, Metropolitan Planning Organization)

The related and dramatic increases in amounts of impermeable surface areas will undoubtedly affect the amount of N and P containing residential runoff. This runoff, combined with much of the discharge from the southeast corner of the state, drains into New Hampshire's estuaries and bays. This has raised concerns among many decision makers looking to preserve the health and commercial viability of New Hampshire's seacoast. To create successful water quality management strategies current and future efforts will need to address the growing impacts of NPS in New England's coastal as well as fresh waters. The suburban development of many rural areas will continue to impede the success of water protection efforts and to ignore the complications that can arise from intensive lawn care practices would be a mistake. This assertion is clear to some working in current water protection efforts, and many strategies acknowledge and incorporate lawn care awareness into their outreach. However, there is a lack of specific knowledge about factors affecting DIYer's lawn care knowledge and behavior that would better guide such efforts, and enhance the effectiveness of public outreach and education.

1.4 Lawn Care in America

Considering the incredible amount of land converted to turf in the United States, the staggering statistics describing big business lawn care, and the

commonplace nature of ritualistic lawn care practices, it is surprising to discover that very little is known about the factors that drive lawn care behaviors. The need for understanding these social dynamics becomes even more evident when one takes into consideration the large volume of research linking lawn care practices and their negative impacts on water quality. Despite these facts, it is clear that turf is an essential part of the U.S. suburban culture.

Over the last fifty years in the United States lawn care has rapidly risen from a weekly chore, to something resembling a hobby, to that of a full blown national obsession. Ted Steinberg's book *American Green* (2005) offers some startling facts that put the importance of lawn care and the breadth of its impacts in the U.S. in perspective. The lawn care industry has been estimated to be worth \$40 billion dollars annually and growing, and turf species of grasses are one of America's leading crops, boasting at least twice the amount of acreage as cotton. There exists an estimated 25-40 million acres of managed turf in the United States. Carved out of that acreage are 58 million home lawns. Turf acreage growth rates have risen dramatically in recent years as suburbia continues its sprawl across a diversity of landscapes. For example, in a 15 year period between 1982 and 1997 the United States established 382,850 acres of new lawn per year. Certainly driven by commercial influences, lawn maintenance has even established a nationally recognized month by the Professional Lawn Care Association of America (PLCAA), with April being the official "National Lawn Care Month". This depiction of lawn care becomes even more profound in recognition of the fact that

many of the most popular species of turf grasses are not even native to the United States. The most popular, Kentucky Bluegrass, is a native of cool damp regions found in northern Europe, yet this species still comprises vast acreage of turf in all manner of climates around the U.S. A quote taken from a lawn care manual written during the 1920's serves to not only underscore this issue but also illustrates just how far lawn related expectations have come over the past 80+ years stating "Don't fancy for a moment that you can have an English lawn in an American climate." (Steinberg 2005: 13).

The result of questing after the "desirable lawn" is a widespread struggle to fertilize, water, weed and utilize all manner of inputs in order to maintain this exotic species in climate zones that are often not suitable for its proliferation. Subsequently other useful grass species, originally introduced as a forage crop for grazing livestock, are now considered undesirable and are commonly labeled "crab grass". The presence of which is a mark of an unsatisfactory lawn, and despite the application of herbicides, it frequently still manages to exist in abundance. A quote from Stuart Little, a New York public relations executive representing a giant in the lawn care industry illuminates some experts views on the subject of crab grass "I would just as soon have a Bengal as part of the lawn as *Digitaria sanguinalis*, which is the sprawling, hairy crabgrass common to the New York area". He goes on to say "The tiger is a lot prettier and not a lot more dangerous" citing the dangers this crab grass poses to ones feet (Steinberg 2005: 43). In order to

understand the underlying issues related to lawn care and lawn care behaviors it is important to understand where America's passion for manicured turf came from.

Converting one's open space from gardens, fruit and ornamental trees, and space for raising animals to an area covered mainly with aesthetically desirable turf species first appeared on the properties of England's wealthy aristocracy. Since then lawns have become a staple of American culture and truly an expression of not only the American way of life, but also of the individual. The 20th century witnessed the birth of the American suburbs, and with it the rapid rise of acreage dominated by turf monocultures. A common regulation concerning the early development of many suburbs required that all dwellings be set back thirty feet from the road. This provided a space that in coming years will stage the battle for the pursuit of the perfect lawn. At first many Americans utilized this land for food and crop production. However with the dawning of the age of consumerism combined with the post World War II housing boom, the lawn as a means of self expression flourished.

Lawn care companies were no longer simply marketing lawn care products and tools, they were promoting an ideal and capitalizing on a widely accessible means of expressing upward mobility. The Levittown suburbs of New York sprung up as a result of William Levitt's ability to mass produce affordable housing for those looking to begin a new post war life outside the overcrowded conditions present in the highly urbanized areas during that time. Along with these new mass produced homes came a mass produced landscape. "A fine lawn," as the Levitt

patriarch Abe Levitt worded it “makes a frame for a dwelling. It is the first thing a visitor sees. And first impressions are the lasting ones.” (Steinberg 2005: 19). The lawn as a showcase for a property evolved into the widely expected social norm, consistent with a time when many suburbs were comprised of cookie cutter houses evenly lined up along a street with little to distinguish one from the other.

Uniformity was a virtue and it was a suburbanite’s responsibility to maintain his or her (usually his) lawn to the neighborhood’s standard of care.

Today in many areas similar attitudes towards lawns still exist, although not everyone shares the same notion as to what a lawn’s purpose is. Some view the lawn as a recreational space that provides them, their families, and their pets with opportunities to be active outdoors. Levels of importance attributed to the different aspects of having a lawn vary a good deal between homeowners. Some will adhere to an intensive maintenance strategy in order to reach a status of lawn care leadership in their local communities, while others do little more than mow often enough to avoid negative reactions from neighbors. It is complexities like these, driving all manner of lawn care behavior, that need to be taken into account when developing outreach aimed at shaping related values, attitudes and social norms. In fact, these examples only serve to illustrate a couple of the surface level variables that need to be understood in order to develop an effective message that will resonate with audiences. Researchers need to gain an understanding of a myriad of specific issues. For example, how do most DIYers address the issue of left over fertilizer? Is it stored for later use? Is it thrown away? In fact the survey portion of

this project revealed that 41.2% of respondents used up all the fertilizer they purchased to avoid having to store it for later use. This serves to further support the previous assertion that over application is likely in many instances.

1.5 Why the Project and Social Science Makes Good Sense

Given the diverse set of variables driving all manner of NPS related activity, understanding the unique characteristics linked to specific behaviors, such as lawn fertilization, is crucial for effectively influencing that specific behavior. Through the application of social science concepts, theory, and research techniques a methodological framework for understanding a number of NPS related issues can be developed. Applying this approach to all manner of NPS mitigation makes a good deal of sense for a number of reasons. For example, traditional approaches often take a top down, regulatory approach that would be more appropriate for dealing with point sources of pollution where one entity can be held responsible. Given the dispersed and everyday nature of NPS, approaches designed to affect individuals are a necessary part of successfully addressing issues.

In addition to social science efforts implemented to enhance the effectiveness of outreach to affect lawn care behaviors this project needs to draw from a wide variety of academic disciplines to be successful. To meet this need a rather innovative approach has been taken in the project reported here. Multiple scientific disciplines have been incorporated into the research plan in order to achieve project goals. Soil and turf scientists are responsible for the development

of regionally appropriate fertilizer recommendations based on soil and seasonal conditions, rather than tradition. Alternative methods for providing a lawn with sufficient level of nutrients are being explored, and will enable the DIYer to achieve a satisfactory lawn without the need to include additional nutrients, or by relying on more environmentally friendly methods for soil amendments. The project's turf experts will also evaluate the prospect of developing new soil and tissue tests with the ability to evaluate a lawn's potential responsiveness to N containing fertilizers. Currently, regardless of the specific results of a soil test all nitrogen recommendations are the same, as the nutrient is believed to be too mobile for accurate assessment of turf needs through soil tests. Through the application of an improved test resulting in site specific nitrogen use recommendations, DIYers will be told whether or not applying fertilizer to their lawn will produce results, if so how much to apply, or if additional nitrogen is simply not needed. The results of this research will provide the foundation for the lawn care recommendations being delivered to DIYers. This research and the resulting recommendations are geared towards reducing losses of nutrients from lawn care practices, but they are also aimed at achieving DIYer's lawn care related expectations. By meeting these expectations DIYers will be more inclined to continue adhering to them in the future.

The social science component of this project addresses the issue of how the information can best be provided to stimulate behavioral change in lawn care practices by delving into the sociological question of "What motivates

environmentally responsible lawn care?” There currently exists very little social research that attempts to answer this question, however there does exist a wealth of knowledge that provides insight into the determinants of environmentally responsible behavior in general. Incorporating refined and empirically supported heuristics such as the Theory of Planned Behavior (TPB) (Fishbein and Azjen, 1975), and the Theory of Reasoned Action provides the theoretical framework needed to investigate the primary drivers of DIYers lawn care choices, and ultimately affect their behaviors. The perceived barriers and benefits associated with adopting more environmentally responsible means of providing sufficient nutrients to turf will also be investigated, as doing so is a central component in Community Based Social Marketing. It is expected that a variety of alternative lawn care methods will meet with different levels of acceptance among populations. Understanding widely held perceptions of these methods will enable the development of messages that can address or capitalize on these points of view.

Also encompassed in the scope of this research is the examination of different sources of lawn care information. By understanding and utilizing current vectors of lawn care information that are perceived to be the most trustworthy, messages will gain enhanced levels of acceptance among target populations. In addition, by understanding what vectors of information are accessed most frequently by the target population the project team will be able to reach the most DIYers possible in their outreach efforts. Evaluating the influence of information sources will enable the project team to reach the most DIYers possible through

established and trusted vectors, and understanding the most effective means of message delivery will conserve project funds by eliminating message delivery techniques that are found to be rarely accessed or thought of as being untrustworthy.

To achieve these goals social science also provides research methods that can best address information needs in the project. A triangulation approach towards data collection that incorporates both qualitative and quantitative techniques provides this research with a strong foundation. The data gathered from a series of 52 in depth interviews can be used to inform the creation of a survey subsequently delivered to community residents. By incorporating the qualitative findings into the survey researchers were able to craft a tool that measured the most common and relevant issues experienced by DIYers based on empirical information, rather than a best guess.

The incorporation of social science will greatly enhance the effectiveness of this interdisciplinary scientific effort, with the hopes that levels of migrating nutrients from managed turf surfaces will be reduced, improving the quality of water and ultimately the quality of life in many rural New England communities. The following work fully describes this social science research by detailing the well-supported theories, ideas, and research methods applied in this project to develop effective environmentally focused outreach. Organized into a traditional thesis format, Chapter two of this document is a review of relevant scientific literature that details and supports the rationale behind selecting the theoretical

framework and research tools used to achieve project goals. The third chapter explains the research methods used to answer the project's research questions and meet other project needs. After a detailed description of the methods employed in this research, the resulting data will be analyzed and described and its utility explored. Finally, conclusions will be drawn and evaluated from the results to outline the value of applying social science theory and research methods for designing and delivering outreach messages intended to influence behavior to achieve a more environmentally responsible society. Concluding this final section will be a listing and detailed explanation of the outreach recommendations that can then be directly applied in outreach scenarios of this type.

CHAPTER II

A Review of Relevant Literature: Understanding Current Theory to Guide Advancements

2. Chapter Overview: Exploring a Foundation of Scientific Contributions

Controlling non-point source pollution (NPS) at a range of watershed and community scales has been the focus of many capable organizations through the application of a variety of methodologies. Yet a number of NPS problems still exist throughout New England. As long as these issues remain, so will the need to develop more effective programs using techniques and ideas grounded in research that uses a variety of analytical techniques aimed at uncovering and shaping the drivers of specific NPS related behaviors.

Sociology and complimentary fields of social science have a long and rich history of conducting research designed to further our understanding of the processes involved in behavior related decision making. A major contribution made by this branch of scientific study is a well grounded body of research examining the effective components of influential outreach methods designed to facilitate sustainable and environmentally responsible choices. A main objective of this study is to advance a specific facet of this important contribution within the field by identifying, exploring and detailing crucial components of an outreach strategy designed to influence underlying drivers of lawn care behavior. The following chapter examines key elements of this body of literature in order to

provide a strong theoretical foundation to guide effective, social science research driven outreach efforts.

Understanding the fundamental influences on behavioral choices lies at the core of this type of research, and is a logical place to begin the literature review. The literature examined here provides the conceptual orientation necessary for further discussion, and provides the foundation on which many other concepts used in this project are built.

2.1 Community Based Social Marketing: Guiding Focused Outreach

Much of the theory utilized in this research can be linked to a set of principles known as community based social marketing (CBSM) (McKenzie-Mohr 1999). CBSM is a framework for outreach and communication design that uses social science research specifically designed to help develop effective techniques for achieving behavioral change at the community level. In fact, one of the more important assertions of this work is that behavioral change is best achieved at the community level:

Most initiatives to foster sustainable behavior rely upon large-scale information campaigns that utilize education and/or advertising to encourage behavior change. While education and advertising can be effective in creating public awareness and in changing attitudes, numerous studies show that behavior change rarely occurs as a result of simply providing information. (McKenzie-Mohr 1999: 150)

CBSM is being recognized by many as having significant advantages over more traditional information based outreach methods (Primack et al. 2007). A host

of research exists supporting the claim that exposure to information alone often holds little sway over behavioral intent (Larson et. al. 1984, Costanzo et. al. 1986, Geller 1981, Jordan 1986). Two important guiding principles essential in CBSM's improved effectiveness are the identification of barriers and benefits towards adopting a newly recommended behavior. Messages that are built upon understanding the perspective of the audience can capitalize on the benefits people expect to receive if they perform a desired behavior, and addressing ways to lessen the perceived barriers to adopting a recommended activity has been shown to greatly enhance outreach efforts' effectiveness (McKenzie-Mohr et al 1995, McKenzie-Mohr 1999). An important key to success is accurately identifying and effectively utilizing these factors influencing behavior adoption. CBSM provides a lens through which the theoretical approach to this project can be viewed to gain a firm understanding of its application and the principles guiding its design.

In addition to this framework CBSM identifies tools that can be used to stimulate environmentally responsible behavior. These tools provide the mechanism through which the theory guiding this inquiry will be implemented in outreach and education. While not an all encompassing list, the tools identified in CBSM include Commitments (facilitating publicly visible pledges to engage in behaviors); Prompts (using specifically focused and frequent reminders to engage in a particular behavior); Norms (using compliance and conformity messages to reinforce the social preference for a desired behavior); Communication (the use of carefully designed, audience driven messages); Incentives (rewards for engaging in

specific behaviors); and Convenience (making performing desired behaviors as easy as possible). To best employ CBSM principles the findings from this project will be used to develop outreach and education that uses these well researched tools to stimulate engagement in environmentally responsible behaviors.

2.2 Understanding Influences on Environmentally Responsible Behavior: Recent Contributions of Social Theory

Having an advanced understanding of decision making processes related to volitional behavioral choices is crucial when creating social science research driven outreach that is effective. To achieve a functional level of familiarity with this dynamic subject matter, it is useful to begin with an investigation of recent social science theory applied in research conducted to understand environmentally responsible behaviors that builds upon previous theoretical and empirical work in the field. The study of behavior is a keystone to much of the work done in this field, and as a result a large body of sophisticated and well supported theory exists to guide efforts to understand factors affecting behavioral choices. A series of works in the theoretical tradition of the Theory of Reasoned Action (TRA) have productively informed the development of this research, and provide a useful theoretical context for understanding lawn care behavioral choices and designing education and outreach to affect them to protect water quality.

The Theory of Reasoned Action (TRA) (Fishbein, Ajzen 1975) represented a strong step forward in efforts to understand the influences on behavioral choices. Although this work is supported by a body of earlier theory, it makes sense to

begin the literature review here because this theory was originally developed partly in response to the weak correlations found between early measures of attitudes and the likelihood of carrying out specific behaviors.

The Theory of Reasoned Action (TRA) asserts that if people evaluate a suggested behavior as being positive (attitude), and if they believe this behavior would be met with approval from their significant others (subjective norm), this results in a higher intention to perform that behavior (motivation) resulting in a stronger likelihood of actually performing said behavior (Fishbein and Ajzen 1975). The TRA is a useful conceptual framework because it deconstructs factors affecting volitional or voluntary behavior, and through that clarification identifies what drives these behavioral choices. Understanding what drives or perhaps guides these decision making processes allows for the creation of outreach that can be geared towards more influential means of message delivery, packaging and construction (Miesen 2003).

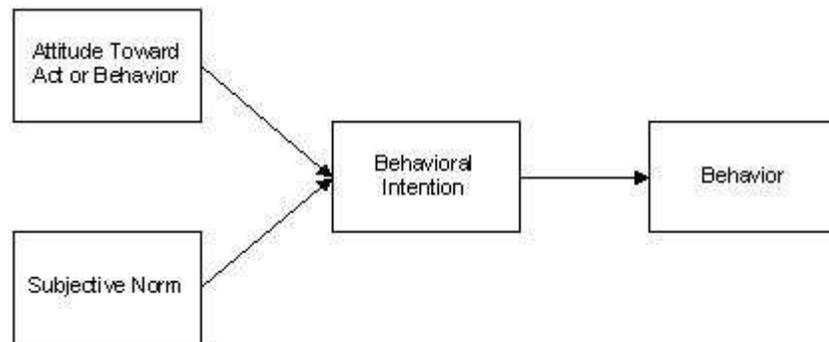
The following three factors comprise the original TRA model and remain central even in today's more refined versions, and thus merit definition in this effort to document the theoretical approach used to conduct this research.

- **Attitudes:** the sum of beliefs about a particular behavior weighted by evaluations of these beliefs.
- **Subjective norms:** looks at the influence of people in one's social environment on his/her behavioral intentions; the beliefs of people, weighted by the importance one attributes to each of their opinions, will influence one's behavioral intention

- **Behavioral intention:** a function of both attitudes toward a behavior and subjective norms toward that behavior, which has been found to predict actual behavior.

(Miller 2005)

Figure 1: *Early model of the TRA.*



(Fishbein and Ajzen 1975)

Figure 1 illustrates the TRA's basic premise that behavior is derived from an intention to carry out that behavior, which in turn is influenced by one's attitudes towards the behavior and the expected or perceived social response to that behavior.

This theory was instrumental in developing an understanding of the weighted influence of one's attitudes and subjective norms on behavioral intention. However, this model is understood today as having some significant predictive limitations (Ajzen 1985, Trumbo and O'Keefe 2001) and has since been refined to improve the model's utility (Eagly and Chaiken 1993, Trumbo and O'Keefe 2004).

Perhaps one of the most significant improvements is the addition of a previously unexplored factor partially capable of accounting for the often weak relationship between behavioral intention and actually carrying out the behavior, an

element now recognized as perceived behavioral control (PBC) (Godin et al, Notani 1998). Within the context of a given behavior there can exist circumstantial limitations perceived by the actor. The freedom to act on one's intention to carry out a certain behavior can be limited by a variety of circumstantial factors such as limits in ability, time, and capital. Other factors with environmental, organizational, or habitual origins can also limit the freedom to act on the expressed intention. Simply stated perceived behavioral control is the perceived ease or difficulty one associates with carrying out the specific behavior (Fishbein and Ajzen 1980, Notani 1998).

This concept translates well into the principles of CBSM. CBSM addresses the concept of PBC when identifying the barriers and benefits associated with behavioral decision making. It is reasonable to conceptualize PBC as a scale of likelihood for the adoption of new behavior, with barriers towards adoption representing a reduction in likelihood while the perceived benefits increase chances of acceptance. Both concepts identify and address some of the key reasons people will or will not act on new information. Understanding that the role of behavioral intention can be limited in volitional behaviors due to a variety of real or perceived circumstances is one of the more important features defining the Theory of Planned Behavior (Ajzen 1985), and the inclusion of this concept was an important step in the cumulative development of knowledge about theoretical approaches for understanding behavioral decision making. In terms of this project and the CBSM framework used to structure it, the consideration of PBC is critical for identifying

barriers against acting on information contained in messages promoting environmentally responsible behavior, including the decreased use of fertilizers on lawns.

Figure 2: *The Development of the TRA Model.*

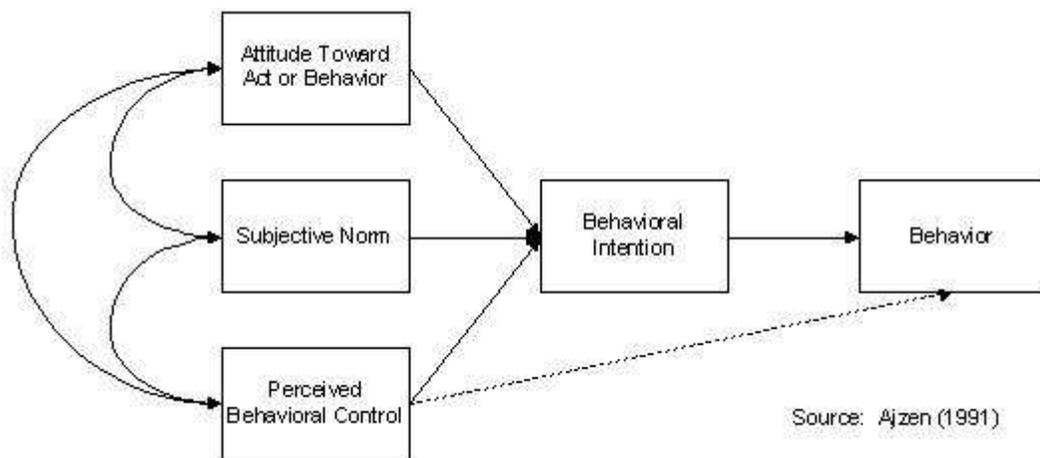


Figure 2 illustrates the direct and indirect role perceived behavioral control plays in predicting behavior. PBCs can act as barriers towards message acceptance and recognition of this variable is crucial when applying this model in outreach scenarios.

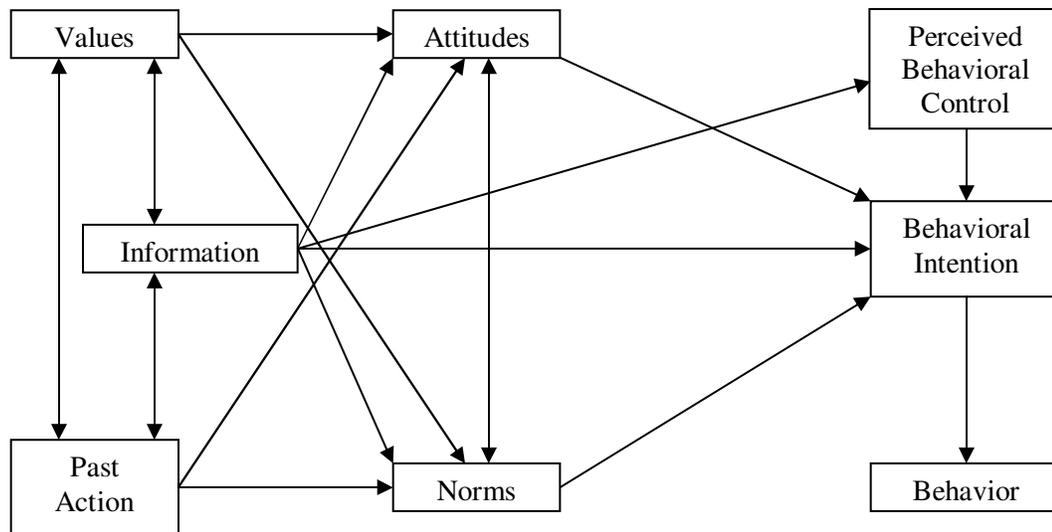
Many works have continued to explore and improve the Theory of Planned Behavior through the inclusion of a variety of additional variables supplementing the original model, and the applications of the theory have taken place in a wide variety of fields that examine a diverse range of behaviors. For the purposes of informing the design of a CBSM program to encourage environmentally responsible behavior, particularly important refinements of the theory can be found in a body of research conducted by Trumbo and O'Keefe (2001, 2005). In these

studies Trumbo and O'Keefe (2001, 2005) examine community members' intention to conserve water in the California-Nevada Truckee River Watershed, an environmental issue grounded in the responsible management of aquatic resources. The model was augmented with two additional variables: the effects of information and values. When the effects of information and values were taken into account they provided the model with additional explanatory power, essentially enhancing the models utility and clarifying how these factors relate to other concepts already in the model. For the purpose of this study these variables have been conceptually defined as:

- **Information:** The exposure to, and perceived importance and credibility of relevant messages and message delivery vectors (neighbors, master gardeners, shop owners).
- **Values:** Ethical ideas and beliefs relevant to the behavior.

The following figure displays the augmented model of the TPB, modified for achieving maximum utility within the scope of this research.

Figure 3: *The TPB augmented for specific use.*



(USDA CSREES Project #2006-51130-03656)

Figure 3 shows the conceptual model for the TPB developed and used in this research. As is evident in past research also utilizing the TPB, augmenting the model in an effort to better address the specific underlying determinants of the behavior in question helps to preserve the utility of the theoretical model. Trumbo and O'Keefe (2001, 2005) found that when the target population is engaged in the information either through the compelling or relevant nature of the information or through other more utilitarian purposes, the addition of information in the model increases the ability to predict behavioral intent. The influence of the information variable in this model is of particular concern in this research. As the model in Figure 3 illustrates exposing target audiences to themed messages provides the research team with a means of affecting a central component of this model.

2.3 Understanding the Mode and of Role Opinion Leaders

The simple exposure to messages (information) delivered by outreach programs attempting to influence the target population often does little to affect actual behavior change. Despite that fact, simply providing information to people is the most common and accepted way to stimulate behavioral change despite often being recognized as a less than effective way to facilitate behavior modification (Rogers 1995; Salwen and Stacks 1997; Goldberg et al.1997). However as clarified by the success of CBSM (McKenzie Mohr 1999), the use of information can play a vital role in behavior modification under the right conditions if the dynamics affecting the influence of information are well understood.

To use information effectively in outreach and education intended to achieve environmentally responsible behavior a clear understanding of how information affects perceived behavioral control, and also how it relates to other factors influencing behavioral change, is essential. This provides sound reasoning for exploring an influential component of the “information” variable within the TPB, namely the role Opinion Leaders play in decision making processes. Past research has explored the roles Opinion Leaders play in the dissemination of information. One influential study defines Opinion Leaders as individuals that disproportionately influence the ultimate shape of the diffusion of new information (Ryan & Gross 1943). These individuals are by definition influential in the dissemination of information. Using the TPB to understand the important role

information plays in behavior change it becomes apparent that understanding Opinion Leaders' perceptions of critical issues is vital.

The TPB also illustrates the importance of understanding the influence behavioral variables have over the environmental choices people make for developing a theoretical model that can be used to guide the creation of outreach and education. Considering the model's utility for specific applications by beginning to define the dimensions of each of the concepts in the model relevant to a specific environmentally responsible behavior clarifies that each behavior comes with a complicated and unique set of circumstances involving a diverse set of variables, each carrying different levels of influence over the behavioral decision. For example, the behavioral drivers that influence decisions about adhering to a more environmentally friendly lawn care program are different from those driving one's decisions regarding proper septic system maintenance, or what type of vehicle to drive. Each of these activities carries its own set of relevant social norms and attitudes, as well as benefits and barriers towards adoption that can be better researched and understood using the theoretical framework described.

Despite the differences across these three behaviors, all three of these behaviors have been linked to the presence of NPS. As a result many organizations develop programs aimed at reducing the presence of NPS from a wide variety of sources, and the design of these efforts does not take into account the unique factors influencing decision making in each specific area. Evidence of this strategy's use can be found in outreach materials developed by a number of

different organizations (United States EPA (1996) “*Managing Nonpoint Source Pollution from Households*” Office of Water EPA 841-F-96-004J).

This approach may act to prevent the development of the most effective outreach possible due to the inability to address the unique influences on specific behaviors. Understanding the specific drivers of lawn maintenance experienced by DIYers, with an emphasis on understanding and describing the themes, messages and vectors essential for the creation of compelling information is central to the social science research conducted in this study. Becoming familiar with existing information seeking behaviors as well as the resulting messages’ content will aid in achieving this goal. In other words, understanding which source of information DIYers are currently accessing for fertilizer recommendations will provide researchers with a vector of information delivery already considered worthwhile by the target population. Furthermore understanding the messages DIYers are receiving may provide insight into current behavioral trends. This practice will serve to highlight any trends in fertilization behaviors that are recognized as having a particularly negative impact on water quality.

2.4 The Role of Social Norms

Another critical component of the model applied in this research is the role of social norms. It is difficult to over emphasize the importance of considering social norms when developing messages aimed at fostering certain behaviors. A number of recent studies have explored the influential nature of this social

phenomenon in affecting choices to engage in environmentally responsible behaviors and other activities (Goldstein, Cialdini, and Griskevicius, 2007; Christakis and Fowler 2008 ;) and indeed the use of social norms to aid in energy conservation was presented before Congress in Dr. Robert Cialdini's congressional testimony in 2007.

To begin to understand the value of this concept in behavior modification it makes good sense to first conceptually define the term in the context of this research.

- **Social norms-** A set of behavioral models and rules that define appropriate behavior in conditional circumstances within a culture.

In other words, social norms are a set of rules shared by members of a culture that guide personal conduct and define appropriate behavior. Despite widespread knowledge of their existence, the role of social norms in influencing environmentally responsible behaviors has only recently become appreciated and is only beginning to be incorporated into education and outreach programs, which is perhaps a reflection of the emphasis on individuality in American culture.

A well regarded recent study provides evidence of the powerful influence social norms can have on environmentally focused behavioral decisions.

Persuasive environmentally responsible messages were delivered as part of a study aimed at measuring the increased ability of social norms to elicit environmentally responsible behavior from hotel visitors (Goldstein, Cialdini, & Griskevicius, 2007). In this study researchers focused on the effects of different message framing on towel use by guests staying in hotels. Guests were exposed to informative cards

detailing the environmental benefits of reusing their room towels, instead of having them rewashed after each use. Different versions of these cards were placed in randomly selected rooms. The informative cards differed in the fact that one contained social normative themes, while the other did not.

Message one:

JOIN YOUR FELLOW GUESTS IN HELPING TO SAVE THE ENVIRONMENT. Almost 75% of guests who are asked to participate in our new resource savings program do help by using their towels more than once. You can join your fellow guests in this program to help save the environment by reusing your towels during your stay.

As apposed to message two:

HELP SAVE THE ENVIRONMENT. You can show your respect for nature and help save the environment by reusing your towels during your stay.

(Goldstein et al 2007)

Notice the thematic differences between the two messages. The first highlights others' acceptance of and adherence to the environmentally responsible message stating; "75% of guests who are asked to participate in our new resource savings program do help by....". The first message also uses language suggesting the reader is indeed part of this social group that largely adheres to the message saying; "You can join your fellow guests in this program...".

Consistent with researchers' hypotheses the results indicated the normative themed messages yielded a significantly higher percentage of reuse (44.1%) over the environmental protection information (35.1%). This concept is certainly not new to the realm of social science, however this study is an important step towards

applying the concept towards promoting environmentally responsible behavior. The results from this and many other studies (Asch 1951; Aronson & O'Leary 1983; Cialdini & Trost 1998) provide strong reasoning for a focused investigation into this social dynamic. The specific norms relating to lawn care practices need to be understood and incorporated into project themes and messages, a sentiment reflected in the following quote. "*Community norms may be the most effective way to discourage the use of pesticides and herbicides on lawns*" (McKenzie-Mohr and Smith 1999)

On a very basic level understanding that people adopt certain behaviors and attitudes partially because they believe others behave, would behave, or approve of this behavior is not an unreasonable summation of this concept. The important point being that this influence has been under appreciated and underutilized in environmental communications. This does however raise a series of important questions to consider regarding factors affecting the strength and likelihood of norm adherence. For example the question "Who?" would elicit the strongest reaction in a target population is important to consider. Past research provides support for the hypothesis that strength of adherence to a social norm grows when the individual perceives the larger group as being similar to themselves (Cialdini & Goldstein 2004). This is further supported by concepts described in Social Comparison Theory (Festinger 1954). Festinger asserts that, "people often evaluate themselves to others - especially to others with whom they share similar personal characteristics" (Goldstein, Cialdini, Griskevicius 2008). This is promising given

the community level scope of this outreach. Creating messages linking individuals to their neighbors or even neighborhoods could provide a way to incorporate this finding and increasing outreach effectiveness.

Another method for increasing the power of norm adherence is to time the delivery of normative messages during periods when the behavior is going to occur (McKenzie-Mohr 2008). For example informing members of a neighborhood that most of the people living near them agree that cutting their grass at a higher height is a good way to reduce the need to fertilize would most likely hold less relevance if delivered in January. The reasoning here being the resonance of the message will decrease over time and the power to affect behavior will weaken.

There is also research warning against scenarios that can produce unintended, and sometimes the opposite effects than desired. As outlined in McKenzie-Mohr's *Fostering Sustainable Behavior*, messages should focus on promoting positive behaviors rather than highlighting the large number of people who engage in the undesired behavior the research is looking to modify. By highlighting the large number of people engaging in the undesired behavior researchers may inadvertently use the power of normative beliefs to reinforce the social acceptance of the undesired behavior. This should act to guide researchers towards the development of pro-behavior messages rather than avoidance related messages. This information can also be used to assess the match between Opinion Leaders' perceptions of challenges and those of DIYer's themselves.

Past research provides support for investigating and understanding the influence Opinion Leaders play in shaping DIYers behavior. Again, looking back to the adapted TPB model used in this research it is clear that Opinion Leaders acting as influential vectors for lawn care information are in a unique position to affect the values, attitudes, norms as well as DIYers perceived behavioral control.

2.5 Focusing the Theory: Opinion Leaders and Why They Matter?

The structure of the theoretical model used to guide this research indicates the key role of information in affecting engagement in environmentally responsible behavior. To begin to understand the complex ways information affects DIYers behaviors it is necessary to understand the sources of information they use, and the information being currently conveyed. To approach this need this project begins with a qualitative inquiry that explores the information provided to DIYers by experts in turf care from various backgrounds including business operators, researchers, and Cooperative Extension, who are conceptualized as Opinion Leaders in DIYers turf care. By interviewing Opinion Leaders researchers can essentially begin to describe the “information” component of the TPB model DIYers are accessing. Since the information variable is a central component to the model, by learning about Opinion Leaders first researchers can then better learn about DIYer attitudes, values, norms and behavioral intentions.

For example if Opinion Leaders are frequently reporting being asked questions related to the use of fertilizer towards meeting lawn appearance goals, it becomes clear that intention to apply fertilizer may be driven by these goals. The

question then becomes what are the variables most influential in affecting goals of lawn appearance? This then enables the creation of survey questions that are able to measure the social norms, values, and attitudes held by DIYers regarding lawn care in a meaningful way. This approach clearly fits the theoretical model and will provide a foundation for discussing the role these Opinion Leaders played in this research.

Opinion Leaders interviewed in this study provided insight into their beliefs about the perceptions held by DIYers regarding lawn care related issues. Often acting as sources of information on issues relevant to this project, the perceptions of Opinion Leaders are very important for the development of outreach and education efforts as they contribute to an understanding of the current social dynamics affecting these issues and the choices DIYers make. At the same time, it is important to recognize the fact that these Opinion Leaders are reporting their perceptions about the DIYer population, and do not represent feedback direct from the DIYer population. It is reasonable to assume that the nature of an Opinion Leader's interaction with the DIYer population has an influence on those perceptions, and accordingly the data collected from Opinion Leaders was further examined in the quantitative stage of the research project which included a random sample survey of DIYers in New England.

Drawing upon the experience of Opinion Leaders is key part of this ambitious interdisciplinary project. Opinion Leaders often field questions or act as sources of information for the DIYer population in a number of ways. This gives

these individuals, in a cumulative sense, an awareness of and appreciation for the questions and concerns held by homeowners who are responsible for the maintenance of their lawns. Through an understanding of the information Opinion Leaders provide and the issues they deal with information that can identify some of the barriers and benefits to environmentally responsible lawn care can be identified, which bridges CBSM and the theoretical model used to guide this research.

2.6 Putting It All Together: A Summation of Theoretical Guidelines

After closer examination it becomes clear that community based social marketing provides a more structured and empirically supported method of behavior modification than the unguided exposure to messages. Through the application of the TPB researchers are able to focus research efforts on deconstructing and understanding the existing, underlying determinants of environmentally linked behaviors. After gaining an understanding of the specific variables linked to particular behaviors within target populations, outreach developers can then begin to utilize previously established, as well as newly designed, sources of information to deliver messages adhering to principles outlined in CBSM. The combination of these perspectives in a new, cutting edge approach has high potential to inform the creation of effective outreach and education. By capitalizing on the advanced understanding of the potential effects and the interrelated nature of behavioral variables, outreach design should be able

to develop messages that capitalize on the integration of these models. Target populations will be exposed to a variety of behavioral influences, the combination of which should produce a stronger adherence to favorable behavioral intention.

Before researchers can arrive at this stage of message development the existing state of these influences on environmentally responsible behavior, as well as their sources, must be examined and described. The following chapter explains the processes with which researchers accomplished these goals. One of the overarching goals of describing the research methods used is to provide the high level of transparency that should be in all quality scientific research, with the ultimate goal being the replication and advancement of the described techniques to achieve success in similarly focused endeavors.

CHAPTER III Research Methods: Study Design and Approach

3. Chapter Overview of Research Methods

This chapter details the research methods employed when collecting data to answer the research questions posed by this study. To set the stage for this section it will first be helpful to introduce the research questions by detailing them in a manner that best provides a foundation for understanding why the research methods used to answer them are appropriate. Second, the sources of data in the research will be elucidated and justified. Following that clarification, the specific techniques and procedures used to collect the data essential for addressing these questions will be reviewed, and sound justifications for their use will be identified. A section explaining the methods used for analyzing the data that lead to logical conclusions about the research questions will complete the overview of the research methods used.

3.1 Defining and Focusing the Inquiry: Introducing the Research Questions

Understanding what motivates environmentally responsible behavior in lawn care is important to the future of environmental quality throughout the Northeast and beyond. Attempting to change the behaviors of landowners to lessen the negative impacts lawn care practices have on their watersheds summarizes the broad focus of this research, however little research currently exists for crafting a means for achieving this goal. Designing an outreach program that leads to measurable change in the lawn care practices small-scale landowners use is a

challenge that can best be met through the use of a social science inquiry explicitly designed to inform efforts to achieve that goal, and this effort represents a critical part of the community based social marketing process.

Whereas there are a great number of programs aimed at fostering more environmentally responsible behavior in a variety of ways, very few have focused on the factors influencing the choices people make regarding lawn care decisions. This project is designed to address the following research questions specifically developed to meet that need given project goals and the theories used to guide the research:

- What are Opinion Leaders perceptions of the expectations held by DIYers regarding lawn care satisfaction?
- What are the most important challenges in achieving lawn care satisfaction?
- What are Opinion Leader's perceptions of the importance of using fertilizer for reaching DIYer lawn care expectations and how might their perceptions vary across Opinion Leader groups?
- What are Opinion Leader's perceptions of DIYer's concern over lawn care practices and fertilizer use and where do their concerns lie?
- What are Opinion Leader's perceptions of the barriers preventing DIYers from currently engaging in more environmentally responsible means of lawn maintenance?
- How do the lawn care expectations as reported by DIYers differ from the perceptions of the Opinion Leaders?

3.2 Overview of Data Collection Design

This research took the form of two major data gathering phases both using different methods of inquiry. The first, being qualitative in nature, took the form of in-depth semi-structured interviews using an open ended interview protocol used when interviewing experts and leaders of opinion about lawn care within the study communities. The second tool of analysis, a self administered questionnaire, was quantitative in it's measurement of actual DIYer responses. The qualitative tool used in this research was designed to elicit data containing the depth and richness attributed to this method of inquiry. In order to meaningfully answer the research questions, researchers first needed to understand and describe experiences DIYers are having when making decisions related to lawn care and the understanding of information provides who heavily influence the norms of DIYer turf care. The qualitative methods employed here, and described in detail later in the chapter, allowed for the freedom to explore unforeseen areas of interest as the data collection process evolved, an essential element of descriptive research. By structuring the qualitative piece first researchers were able to maximize the utility of the findings gathered through inductive analyses by using emergent patterns and conceptual categories as tools for guiding the development of quantitative research methods (Miles and Huberman 1984). The process of inductively analyzing qualitative data is well supported (Glaser and Strauss 1969) and can help develop the conceptual framework often needed for describing complex social phenomena.

The second stage of research consisted of a self-administered questionnaire survey delivered to a randomly selected sample of residents within five purposively selected study communities, which was developed using insights from the qualitative research. This provided researchers with the ability to precisely and accurately capture these concepts in a form that could express the findings using the explanatory power of numbers (Neuman 2007).

Known as the methodological triangulation approach to data collection (Neuman 2007) this method has a number of advantages over research using only a single method of data collection. First, both categories of methods for sociological data collection have their own strengths and weaknesses. For example some of the strengths attributed to quantitative methodologies include the ability to replicate research allowing for comparison, and the assertion that reliability and validity can be determined in a more objective manner. Using statistical analysis to understand relationships also carries with it the explanatory power of showing statistical significance. However, past research also highlights the inability of the quantitative approach to capture important underlying meanings, situational contexts, and also the ability to provide the depth sometimes needed to fully understand social phenomena (Jones 1997). Also, when choosing to use a quantitative approach in the social sciences one assumes that "people can be reduced to a set of variables which are somehow equivalent across persons and across situations" (Reason & Rowan 1981, p.14). This is not to suggest that qualitative methods are always going to be a better choice. Indeed it has been argued that the often low sample

sizes associated with qualitative research may produce findings not representative of the greater study population. Another frequently cited limitation concerning findings derived from these processes is a reduction in confidence that the research is completely valid, due to the fact that the “truth” of the finding is difficult to pin point given the need for researcher interpretation of the data. However the strengths attributed to qualitative research include the ability to allow the introduction of concepts from a more emic perspective rather than creating and adhering to pre-determined subject areas (Jones 1997). By employing both types of data collection techniques the triangulation of these methods and measures produces more valid and reliable results (Neuman 2007).

There exists a debate among those who argue for the explanatory power of one form of data collection while citing the weaknesses in the opposing method; this can be seen in a quote from Fred Kerlinger “*There is no such thing as qualitative data. Everything is either 1 or 0*” (Miles and Huberman 1994, p.40). Alternatively D.T. Campbell argues “*All research ultimately has a qualitative grounding*” (Miles and Huberman 1994, p.40), the point of this discussion is not to provide support for one form over the other, but rather to illustrate the strength of utilizing both to form more complete and useful findings. In this case the applied qualitative method is not only used to develop findings that can stand alone, but is also used to inform the creation of the quantitative piece.

This thesis focuses on findings from the qualitative portion of the research as the best source of information to address most of the specific research questions

examined in this work. Findings from the quantitative data collection and analyses are discussed when either both forms are being compared for the sake of clarification, or when the research questions focusing the study require comparable data sources, as in the need to understand differences between Opinion Leaders and DIYers' perceptions and attitudes.

3.3 Opinion Leaders: Who They Are & Where They Come From

Initially a group of respondents were purposefully selected by project team and steering committee members for participation in interviews. Through the use of snowball sampling techniques respondents from this initial group aided in identifying additional contacts, resulting in a final group of 52 Opinion Leaders that were interviewed. This technique proved useful for the identification of experts that may otherwise have gone unrecognized due to a wide diversity of Opinion Leader backgrounds.

Because of the diverse nature of these Opinion Leaders' backgrounds and differences in interactions with DIYer populations it is clear that Opinion Leaders may develop differing perspectives towards DIYers based on the types of interactions in which they engage. For outreach and education purposes it would be useful to examine trends in responses across different groupings of Opinion Leaders. To perform this analysis four different groups were conceptualized based upon the Opinion Leader's orientation to the DIYer. These groups of Opinion Leaders were conceptually defined based on the Opinion Leader's involvement

with the related topics as well as the nature of their interaction with DIYers and significant differences in these factors exist among them. Organizing them into categories provides a conceptual organization needed for analyzing results across groups which is necessary for an accurate understanding of their influences on DIYer turf care practices. Appearing below is the first question appearing in the interview protocol, which will be detailed in the next section. This question was designed to elicit, through their own words, a description of the Opinion Leader's orientation to the DIYer.

“To begin, tell us a little about your work with DIYers.”

These four conceptualized categories emerged from an inductive analysis of the responses given:

1. Outreach / Educators
2. Scientist / Researcher
3. Industry / Business
4. Community Expert/ Alpha Neighbor

The Outreach/Educator Group:

The Outreach/Educator category contains the greatest number of individuals from any Opinion Leader group, consisting of over half of the entire Opinion Leader population of respondents. These Opinion Leaders interact with the DIYer through educational activities. Acting as sources of information, this Opinion Leader group directly interacts with the DIYer by fielding calls on Master

Gardenerhotlines, facilitating educational workshops, developing and implementing outreach programs, creating and distributing informational literature regarding these topics, and many other activities. This group includes Master Gardeners, citizens who are trained and certified by Cooperative Extension to educate the public. Oftentimes this Opinion Leader group will act as distributors of information developed by other Opinion Leader groups, facilitating the delivery of lawn care related information.

Understanding what sets these respondents apart from the others can best be explained by looking at the motivations behind their work. A large part of the Outreach/ Educator's profession is providing the public with information. They are an information source that can be accessed in a number of ways by anyone wishing to pursue accurate, well-supported information regarding gardening and lawn care related subjects. This results in a high degree of interaction between this Opinion Leader group and DIYers. Examples of positions held by this Opinion Leader would be Cooperative Extension staff and master gardeners.

The Scientist/ Researcher Group:

Members of the Scientist/ Researcher group may have some teaching appointments in institutions of higher learning such as universities, but their main focus lies in research on lawn related topics. These Opinion Leaders include water, soil, turf, and horticulture scientists specializing in a wide range of disciplines. Of particular interests in this group are turf scientist academic researchers who

specialize in the study of turf production and management. Interviewing this group was important because they act as the sources of information being delivered to the public via the outreach/ educator Opinion Leader group, and also serve as key parts of policy and regulatory processes. They are also the Opinion Leaders with the most expertise in developing the ideal lawn “quality” results.

The Industry/Business Group:

This category contains Opinion Leaders that work in a profession dealing with lawn related issues outside of academia. Their orientation to the DIYer is one of a professional nature, often providing products and services related to lawn care for a monetary cost. These include lawn care companies, point of sale companies (such as garden supply stores or garden centers in big box stores), lawn chemical suppliers, sod farmers, etc. The important distinction here is that these Opinion Leaders are invested in lawn care in a professional and business manner relating to the need for profits, and thus may hold uniquely different points of view. It is important to note this Opinion Leader does act as a source of information, and is perhaps even the most frequently accessed by DIYers.

The Community Expert/Alpha Neighbor Group:

These Opinion Leaders are influential in their communities in the realm of gardening/ lawn care opinions, but do not have a professional career related to these topics. These include neighbors that would be considered sources of

information, values, and opinions at a neighborhood scale. Although a small portion of those sampled, this category of Opinion Leader provides insight into the transfer of information on a neighborhood scale that includes higher levels of familiarity and trust. This source of information was reported as being influential to the DIYer community by other Opinion Leaders and merited inclusion into this project.

3.4 Methods of Qualitative Inquiry

Semi-structured in-depth interviews were carried out with turf care Opinion Leaders. This interviewing method uses a interview protocol consisting of a set of pre-determined questions designed to guide the discussion towards useful topics while allowing for unscheduled yet useful digressions (Berg 2007) .The freedom to explore previously unrecognized areas of interest in subsequent interviews is especially important in a descriptive investigation, as these topics may generate significant analytical insights. For example a question appearing in the protocol asks; “What types of fertilizer application techniques do you recommend DIYers use?” A response to this question has been; “I always recommend home owners use a drop spreader.” Without the freedom to explore the issue further researchers would lose the contextual significance of this response. By probing deeper into this response by asking, “Why do you recommend drop spreaders?” the Opinion Leader then provided the researcher with additional information resulting in a much more meaningful answer. Essentially their reasoning was linked to the ability of a drop spreader to more accurately apply fertilizer to target areas reducing the

amount of fertilizer unintentionally applied to impervious surfaces. It was their belief that the use of this method of application would reduce the negative impacts of fertilizer on water quality.

A total of 52 interviews were conducted in person whenever possible, and the vast majority of them were face to face interactions. This portion of the research took place between the month of June and August in 2007. Researchers worked with Opinion Leaders to schedule a time and location most convenient for the Opinion Leader in an attempt to be as unobtrusive to their schedules as possible. Interviews typically lasted between 30 and 45 minutes, with some occasionally lasting up to an hour or more. Respondents were assured that the confidentiality of their responses would be protected, and that no testimony about individuals or groups would be linked back to them, giving the respondents the ability to answer freely and openly express any opinions without concern of recourse. A “snowball” sampling technique was used to identify potential respondents where respondents would be asked to identify additional subjects. This was the focus of the last item in the interview protocol. Initially respondents were contacted by phone or email and from here scheduling a time and place to meet would follow. Although no respondents refused a request to be interviewed during the course of this process, some were reluctant at first to speak candidly about their experience presuming this project would have negative repercussions for their business. To address these concerns it was explained to these respondents that this study seeks the input from as wide a variety of experts as possible and that their

input would give voice to their concerns regarding this subject matter. They were assured that their opinions and responses would be respected and be equally influential as any other respondent regardless of their stance on these issues.

As appropriate the International Review Board review process was carried out ensuring no harm would come to participants as a result of this study. The interviews were recorded in detail and notes were taken during the course of the interview on copies of the interview protocol providing an organized method for storing and retrieving the data. After recording and inductively analyzing this large volume of information patterns of responses began to emerge that aided in the creation of a carefully constructed questionnaire, which was administered to randomly selected homeowners in five target communities across New England.

3.5 Developing the Protocol

As previously mentioned, interviews were conducted using an open ended interview protocol designed to elicit the most relevant and useable information possible. To develop a set of questions that would elicit a large amount of useable data researchers first consulted literature that informed the creation of well designed research questions. The goal of studying past research on creating effective qualitative inquiry was to design a protocol that contained relevant and insightful questions that were unbiased in presentation, so that a variety of diverse experts could answer openly and truthfully.

Using the Theory of Planned Behavior model as a guide for meeting project objectives, important topics of inquiry focusing on the variables within the model were first identified. For example to understand Opinion Leader's perceptions of DIYer attitudes regarding concerns over fertilizer use researchers asked:

- Do homeowners have any existing concerns over fertilizer use?
 - Are there any concerns about impacts on family and/or pet health?
 - Are there concerns about the relationships between lawn care behavior and environmental quality?
 - What are they most concerned about?

- Do you answer any questions concerning the use of fertilizer and water quality?
 - If so what is the nature of these questions?
 - What responses do you give?

The interview protocol was developed in conjunction with the project team's personnel and then with the larger set of experts serving on the project's steering committee. These experts were able to highlight many different facets of lawn care issues affecting lawn care experts and DIYers that would have otherwise gone unrecognized. Table 1 below contains examples of interview protocol questions and illustrates how these topics of inquiry represent key components in the theoretical model.

Table 1: *Interview protocol informing the theoretical model*

<u>Values</u>	<ul style="list-style-type: none"> • What do you believe most people are looking for in terms of being satisfied with their lawn care? • Can lower application levels and/or the use of alternative fertilization techniques produce the results homeowners are looking for, or would people's expectations about lawns have to change?
<u>Attitudes</u>	<ul style="list-style-type: none"> • Do homeowners have any existing concerns over fertilizer use? • Are there specific concerns about the relationships between lawn care behavior and environmental quality?
<u>Norms</u>	<ul style="list-style-type: none"> • What are the most common questions DIYers have about fertilizer use? • What do you believe most people are looking for in terms of being satisfied with their lawn care?
<u>Information</u>	<ul style="list-style-type: none"> • What are the most common questions DIYers have about fertilizer use? • When do you advise most DIYers to apply fertilizer? • What do you base this decision on? • Do you test the soil? • Where do you look to for your fertilization information? • What types of fertilizer do you most frequently recommend? • What types of application practices do you recommend DIYers use?
<u>Perceived Behavioral Control</u>	<ul style="list-style-type: none"> • What are the most common reasons DIYer's don't engage in more environmentally friendly lawn care practices? • What are the biggest challenges in lawn care to achieve the results homeowners' desire?

3.5.1 *Rational for the Geo and Social Spatial Scale of the Research*

This study took place in New England in purposively selected communities within the states of New Hampshire, Maine, Vermont, Rhode Island, and Connecticut. Subsequently each state's Cooperative Extension program had representation in the project team. This proved to be essential for a number of reasons including the identification of local Opinion Leaders and access to the knowledge and expertise needed to create outreach that was relevant to local populations.

Unlike many programs concerned with water quality the area of focus for this research was not conceptualized at the watershed scale. The tenants of community based social marketing theory stress the important roles that norms, information, attitudes, values and other community culture influenced phenomena play in making behavior related decisions (McKenzie-Mohr and Smith 1999). While not ignoring the affects of non-interpersonal variables in lawn care (such as messages appearing on product packaging or in television commercials) working within the social sphere of a community or a neighborhood enables inquiries in which researchers are best be able to understand these socially defined factors that are heavily influenced by community level factors. A core objective of this study is to identify and understand vectors of information delivery and how they relate to messages' ability to influence neighborhood and community level norms and attitudes. Support for this assertion is best summarized in a passage, appearing below, taken from this project's grant proposal.

According to the work of Fishbein and Ajzen themselves, subjective norms are “determined by salient normative beliefs concerning the perceived normative prescriptions of specific referent groups or individuals and motivations to comply with each of these referents” (Fishbein and Ajzen 1981: 342). Bright et. al.’s study of environmental activities further specifies that, “[B]ased on this definition, the key to changing the subjective norms of an individual lies in changing what an individual perceives a specific referent group would want (normative beliefs) and/or his desire to comply with the opinions of that group” (Bright, Manfredo, Fishbein and Bath 1993:266). Given these theoretical underpinnings, the optimal geospatial scales for testing the hypotheses in this research are the neighborhood and community levels, as it is these groups that serve as the referent group for lawn care norms in American culture (Jenkins 1994).” The neighborhood level is a subset of the community scale, which is itself a subset of the watershed scale. Given the theory behind this project working at the neighborhood and community scales are appropriate, and in aggregation changes at these levels will result in watershed level changes. (USDA CSREES 2008 "Changing Homeowner's Lawn Care Behavior to Reduce Nutrient Losses in New England's Urbanizing Watershed." project #2006-51130-03656)

The necessary question for conducting effective research that follows is, “Which neighborhoods within a community accurately represent that community as a whole?” The answer to this question was supplied by project team members, whose expertise it is to deliver and or implement outreach efforts within these focus communities. In addition, these neighborhoods were also selected because of the existence of extension programs within them that could employ the ideas developed from this research in a timely manner to make possible their evaluation. Detailed descriptions of the neighborhoods were researched in the quantitative survey stage of the project which measured, variables including the neighborhood’s levels of income, whether residents perform their own lawn care or use a service,

age of the development, type of residency and number of year round residents. Questionnaires and messages delivered to the study regions populations contained the names of their towns and bodies of water familiar to them fostering a sense of belonging and ownership to enhance response rates.

3.5.2 The Quantitative Method of Inquiry

The quantitative stage of this research consisted of a self-administered questionnaire survey delivered to a scientifically random sample of residents from the five purposively selected communities. 300 community residents were randomly selected in each study community. In order to facilitate the evaluation of the project's outreach and education component, the community data collection also sampled residents of the neighborhoods targeted for Cooperative Extension activities, by administering the survey to an additional 80-150 households in each of the neighborhoods defined by the project's team members.

After careful consideration and deliberation the randomly selected 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 New Hampshire court ruling made such data unavailable by law.

The random sample survey was administered 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).

Given the need to gather and process information from a large research population where trends, patterns, and correlations are needed to inform the creation of outreach messages the use of a quantitative data collection method was necessary. The use of a survey administered to a scientifically random sample of community and neighborhood residents allows for the collection of numerical data that can be analyzed statistically. The information produced and the relationships identified are then generalized with more confidence than the qualitative data and combining the data collection techniques minimizes the weaknesses of both methods while adding to their strengths.

In combination this qualitative and quantitative data provides information on the variables and relationships in both the community as a whole and in the neighborhoods targeted for Cooperative Extension activities. Using this approach

to collect data produces reliable and valid information, and also facilitates an evaluation of the Cooperative Extension deliverables developed in this project in the final stage of the research.

3.5.3 *Analyzing the Data*

The responses to some survey questions were used to highlight useful consistencies or contrasts between perspectives held by Opinion Leaders and those reported by DIYers and that information is used in combination with data that is the focus of this work. For more detailed information on the quantitative portion of the work readers are encouraged to see the social science summary report at:

<http://www.plymouth.edu/cfe/projects.html>).

During the course of the interviews handwritten notes were taken on blank versions of the interview protocol and the complete interviews were recorded. Any useful digressions into other relevant topics were also recorded for later analysis in the same manner. These sheets and recordings were then collected and inductively analyzed in their entirety (Glaser and Strauss 1969). Emerging conceptual categories and patterns that emerged from the data were then described and recorded (Miles and Huberman 1984). In an effort to uncover any useful differences between study regions the findings were then analyzed across states. To do this the recorded data sheets from the interviews were organized by state, and new summaries were developed for using the same inductive analysis employed when digesting the full summary. This state by state analysis was performed

largely in part due to the differences in the variables facing DIYers' decisions across state lines. For example, the challenges facing turf managers in northern Maine are very different from those faced by the Rhode Island DIYer population.

An analysis across Opinion Leader groups was also performed. It is reasonable to assume that perceptions Opinion Leaders hold regarding DIYers would vary across groups given the diverse nature of their interactions. For example as researchers it is responsible to suspect questions fielded by Cooperative Extension's Master Gardenerhotline employees may be drastically different from those fielded by professional landscapers, lawn product distributors or even neighborhood leaders in lawn care. Understanding that these interactions may differ given Opinion Leaders' various orientations to DIYers, merits investigation. This becomes especially clear when taking into account that Opinion Leaders are active sources of information and the resulting information presented to DIYers may also differ.

After this series of inductive analyses were summarized into reports they were each compared to the findings derived from the quantitative piece to address specific project needs. This analysis was also used to investigate research questions that examine differences existing between DIYer lawn and lawn care expectations as reported by Opinion Leaders, and those expectations reported by the DIYer population. Referring back to the TPB, Opinion Leaders acting as sources of information play a central role in shaping and influencing DIYer perceptions and thus merited close investigation for answering the research questions in a detailed

and meaningful manner. The results of this investigation are described in the next chapter. Following the description of the findings from this investigation is a chapter detailing their implications for achieving project goals.

CHAPTER IV Description of Results

4. Overview of Results Chapter

The results of the investigation described in the previous chapter are detailed below. Research findings are organized by research question, and are presented in a logical order that allows the findings to build upon and support subsequent findings. The goal in this chapter is to consolidate the findings in a useful manner and to provide sound reasoning for their application when developing outreach and education methods. The chapter following this one details the application of the findings and their contributions towards achieving project goals.

4.1 What are Opinion Leaders Perceptions of the Expectations Held by DIYers Regarding Lawn Care Satisfaction?

The first research question addressed in this chapter sets the tone for thinking about how the data elicited from Opinion Leaders should be used towards the creation of outreach methods. Recognizing that these findings are generated based upon interviews exploring the interactions between Opinion Leaders, as acting sources of information, and DIYers sets the stage for interpreting what these findings mean, and what the information being sought says about the DIYer experience. Capturing the intent of this particular inquiry was done by developing a protocol question that rather directly asked:

What do you believe most people are looking for in terms of being satisfied with their lawn care?

The broad nature of this question provided Opinion Leaders with the freedom to comment on what they perceive to be the key issues relating to lawn care satisfaction. Without the need to choose between a set of pre-determined responses, Opinion Leaders weren't restricted in the nature of their answers. Framing the question in this manner led to a variety of answers in which a number of previously unforeseen, yet useful trends and patterns emerged.

Throughout the interviews Opinion Leaders most often expressed lawn care satisfaction in terms of the results. Factors including the color of the lawn, the presence of non-turf species such as weeds, and the thickness or density of the turf were all reported multiple times as being indicators of lawn care satisfaction.

When it comes to lawn care people want a mainly mono crop, a full thick green landscape. Weeds need to be closely managed in order to achieve the look people generally want.

Most people would like their lawns to be green, mostly grass with a minimum of weeds. Density is also important. The ideal lawn is the golf course high input, "trophy lawn".

Many Opinion Leaders characterized the type of lawn DIYers would be satisfied with as the "perfect lawn". In line with appearance related factors being linked to lawn care satisfaction, comparisons were made to examples of desirable lawns by Opinion Leaders when describing DIYer lawn care satisfaction. The

examples of desirable lawns ranged from golf courses and pool tables to carpets and sports fields.

Typically they (DIYers) want it green as possible, and weed free. A thick lawn is more desirable because it is greener. Most people want the golf course look as apposed to a healthy lawn.

Most people's level of lawn satisfaction varies. Most people want the type of lawn they see on television. The "pool table" type of appearance.

A reported finding provides evidence of the power of social norms to effect desired appearances of turf. The desire to "fit in" with the perceived standard of lawn care present in DIYer's neighborhoods was also reported a number of times. Interestingly the Business/ Industry Opinion Leader group most often cited this as a factor of a satisfactory lawn care.

Standards vary between neighborhoods, people want to and are often expected to maintain their to at least the neighborhood standard.

A lot of our customers will vary, many want a lawn good enough to keep their neighborhoods looking uniform. At the other end, are people looking to be the leaders of their neighborhood (in terms of lawn care). "Commercial" people want to satisfy the majority of customers and still be cost effective and will aim for the middle.

If as these responses suggest, satisfaction in lawn care is related to meeting the neighborhood's standard of lawn care, then developing outreach methods that target that standard at the neighborhood level could prove to be effective. There is evidence to suggest that there exists alternative measures of lawn care satisfaction

that are not related to the appearance of the lawn. Although these components of lawn care satisfaction are held by a number of community members, there is a lack of cues or prompts identifying these determinants of satisfaction as being commonly held, the way a vigorously managed lawn provides social normative cues for adherence to that style of management. These alternative measures deal largely with recreational safety as well as water and environmental quality.

4.1.1 A “*Healthy Lawn*”

Having a “healthy lawn” was reported as a common desire of the DIYer, and could likely be seen as a presence of the top three appearance related factors (color, lack of non-turf species and density). 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 result in a type of lawn that demands high levels of input (input being everything from lawn care products to water) and intensive management strategies. These conditions clarify that creating opportunities to re-define the image of a healthy lawn may be a productive endeavor for future stages of this project.

This becomes especially apparent when analyzing other aspects constituting the “desirable lawn”. Varying expectations over lawn care satisfaction were also reported to be related to the function of a lawn. The function of a lawn is what the

lawn is used, or expressly not used, for by the homeowner. Uses ranged from a lawn that acts to showcase the house or property to a safe open space utilized by the family for recreation purposes. This is a particularly important finding given the apparent link between the lawns use or purpose and perceptions of satisfaction related to lawn care. One Educator/ Outreach Opinion Leader makes mention of a split between those who recreate on their lawn and those who want a more aesthetically pleasing lawn. It was felt that often times those in the pursuit of a “perfect” looking lawn will be those that spend the most time managing it and the least amount of time actually recreating on it. The reciprocal is also true. This has far reaching implications for outreach and education design.

Most people want a green space for recreation or at least a space that looks like a lawn, a barrier to the woods or wilderness. Others demand a golf course lawn dark in color with no pests or weeds, that isn't to be stepped on.

4.1.2 Environmental Factors Driving Lawn Care Satisfaction

A point of view expressed by an Industry/Business Opinion Leader states; “Most people want a lawn that will fit into the neighborhood they are in while others want to be the leaders of lawn care in their neighborhoods.” These types of neighbors most likely influence neighborhood level lawn care norms by setting appearance related lawn care norms. It was sometimes said that most DIYers want a lawn they can be “proud” of maintaining. Having a lawn that can “fit in” with the rest of the neighborhood is seen as an important factor when defining the desirable

lawn. Acknowledging the influential role of social norms will be beneficial in designing ways to create community level change when developing the outreach program. One potentially effective course of action is to attempt to shift the focus of norms from the color and appearance of the lawn to a different perspective that includes environmental, not just aesthetic, factors.

The expressed desire to achieve a desirable lawn care results without harming the environment was also reported as being an important factor affecting levels of lawn care satisfaction. This provides evidence of the potential for certain outreach and educational messages to stimulate behavior change. Creating a recommendation that balances effective lawn management while illustrating the environmentally beneficial aspects of the strategy will resonate with an existing population of DIYers.

4.2 What are the Most Important Challenges in Achieving Lawn Care Satisfaction?

Following the first question Opinion Leaders were asked;

What are the biggest challenges in lawn care to achieving the results homeowners' desire?

This inquiry was designed to illicit important information for designing outreach messages that would address current concerns regarding satisfactory lawn care. Balancing the need to develop environmentally sound outreach that also provides the DIYer with a means for achieving satisfaction in their lawn care is essential for enhancing acceptance of outreach messages. It was reported by Opinion Leaders that many of the most difficult challenges in achieving the lawn

DIYers want only exist for those looking to achieve the “perfect lawn”. A frequently identified challenge to achieving desirable lawn care outcomes was unrealistic expectations, which Opinion Leaders perceived to be heavily influenced by media representations of lawns.

It was stated that marketing efforts are creating an unrealistic image of what lawns should look like. Often times these influences present examples of desirable lawn care expectations that are unreasonable and unachievable unless the DIYer poses an advanced level of knowledge and is willing to spend exorbitant amounts of time, money and labor. One Opinion Leader stated:

People expect to have the types of lawns seen on television. People often expect to have a golf course in their backyards. This is difficult to maintain throughout the season and requires more work than they are willing to invest.

Appearing at the other end of the lawn management spectrum was the frequently reported desire to follow lawn care practices that are affordable and are the least time and labor intensive as possible. A number of Opinion Leaders feel that in combination these expectations are not realistic. One Opinion Leader sums up this finding by mentioning that “People want a perfect lawn without having to do what is required to achieve that lawn.” It was common to hear these Opinion Leaders also mention that most of the challenges that present themselves in lawn care only exist for those DIYers having very highly set expectations.

4.2.1 *Time, Money and Labor*

The effort (time, money and labor) spent on attaining a satisfactory lawn represents an important variable of lawn care satisfaction, and one not completely driven by the appearance of the lawn. It was reported, often by Outreach /Education Opinion Leaders, that DIYer's exhibit a desire to spend as little time as possible achieving a satisfactory lawn. In one interview this was seen as being the major component of satisfactory lawn care. It is reasonable for outreach purposes to define a satisfactory lawn as one that meets community standards. Affordability was also reported as being a component of satisfactory lawn care, while the ease or difficulty of the labor involved with a particular management strategy was rarely specifically expressed although it is highly likely this concept was implied when Opinion Leaders discussed lawn care satisfaction in terms of the effort needed to carry out the strategy.

The most important and commonly cited challenge facing nearly all levels of management strategy is a lack of knowledge regarding effective lawn care. Across the categories of Opinion Leaders it was felt DIYers generally have very little accurate lawn care knowledge about almost all aspects of lawn care techniques.

The biggest challenges homeowners face is the proper application of water, pesticides, and fertilizer. If incorrectly applied or if the wrong product is applied the results will not show.

Education. They see a one product fits all approach. People are applying products they don't need and are not addressing their lawn's specific needs.

This concept even applies to some of the least intensive and less sophisticated methods of lawn care as highlighted by Opinion Leaders.

Understanding the basic proper maintenance techniques, (DIYers) aren't aware of the proper mowing and grass heights.

The concept of mowing height and grass length may be an important concept to include in environmentally focused outreach. As cighted by a number of Opinion Leaders when grass is cut very short the plant becomes stressed. Consequently the turf requires more intensive management strategies, namely nutrient input, to support its continued proliferation. Addressing this issue by mowing slightly less frequently and raising the height of the mower blades requires very little, if not less, effort.

4.2.2 Results of a Lack of Knowledge Among DIYers

Two important trends have emerged in the form of negative consequences stemming from a lack of accurate lawn care knowledge amongst DIYers. First, the lack of knowledge often prevents DIYers from effectively addressing their lawn care issues. Opinion Leaders report the inability to properly identify and treat lawn care problems. DIYers were reported to rarely understand their turf's yearly growth cycle, which has important implications for effective fertilizer application. There were several incidents where Opinion Leaders reported a lack of understanding

regarding proper turf species, soil conditions and necessary climate considerations. It becomes clear that without an understanding of these influential factors many DIYers looking to achieve a well manicured turf will encounter a good deal of frustration.

The second important consequence of a lack of information in need of discussion is the environmental degradation that often results from uninformed lawn care practices. The inaccurate application of water to the turf can result in the off site migration of many fertilizers. Also a frequently cited issue is the belief that most DIYers do not know the square footage of their lawn. This is an important figure to be aware of to avoid incidents of over application of lawn care products, since many products instruct the user to calibrate their spreading equipment based on square footage. Providing turf with an unnecessary amount of nutrients also results in nutrient migration. Applying nutrients to turf during non-growth periods also results in an excess of nutrients, resulting in DIYer frustration and the presence of excess nitrogen and phosphorous. Opinion Leaders also make mention of the uninformed use of “combination products”. The product often appears as a fertilizer/ herbicide/ insecticide mixture and is designed to address several common lawn care problems in one or several applications. Unfortunately many DIYers will use combination products to address one problem whether accurately identified or not. As can be seen Opinion Leaders identified a number of areas where the use of information will play an important role in reaching project goals and provides further evidence that the approach taken in this project is an effective one.

4.3 What are Opinion Leader's Perceptions of the Importance of Using Fertilizer for Reaching DIYer Lawn Care Expectations and How Might Their Perceptions Vary Across Opinion Leader Groups?

This inquiry was answered in a rather direct yet multifaceted fashion.

Several items in the interview protocol can be used in conjunction to fully conceptualize the views held by Opinion Leaders regarding the importance of fertilizer use. The first item appearing in the protocol focusing on this topic appears as;

How important is fertilizer application to achieving a desirable lawn?

Following a discussion of the results from this question, will be a discussion of the results from these protocol items asking;

- ***When do you advise most DIYers to apply fertilizer?***
 - ***What do you base this decision on?***
 - i. ***Do you test the soil?***
 - ii. ***Where do you look to for your fertilization information?***
- ***What types of fertilizer do you most frequently recommend? Why?***
- ***What types of application practices do you recommend DIYers use?***

After analyzing the responses to the first question “How important is fertilizer application to achieving a desirable lawn?” it becomes clear that many of the responses given by Opinion Leaders may be shaped by their interaction or relationship with the DIYer population. For instance the owner of a landscaping business may feel the application of fertilizer is vital to their customers’ satisfaction. As was discovered there sometimes exists factors other than turf need that may shape a given Opinion Leaders answer. It was reported that customer satisfaction in professional lawn care was linked to the number of visits the lawn

care company made to each site. This may drive up the number of fertilizer applications independent of soil conditions. It is important to note that homeowners that choose to make use of a lawn care service are by definition not DIYers, however it is also important to recognize their may exist alternative motivation resulting from a number of scenarios beyond the need for desired turf growth, prompting some of the responses given by some Opinion Leaders. Recognizing this as a potential for effective outreach an analyses across Opinion Leader groups was conducted and the results are described at the end of this section. The implications for outreach creation resulting from these findings are described in the next chapter.

4.3.1 *How Important is Fertilizer Application to Achieving a Desirable Lawn?*

Fertilizer was reported as being important for achieving a desirable lawn by nearly twice as many Opinion Leaders then those claiming fertilizer is not important. A small number of those citing the importance of fertilizer even went further stressing the application of fertilizer is a *very* important aspect of successful lawn care. However tempering this finding was the fact that almost all Opinion Leaders made mention of the variability in the importance of fertilizer application. The most frequently cited determinant of the importance of fertilizer use was the age of the lawn. Newly installed turf as can be found in a newly constructed housing development will require fertilizer. This was reportedly due to the poor

soil conditions and lack of top soil after the build site has been graded for construction.

Another major factor driving the need for fertilizer is the species of grass selected for planting on a site. Given New England's variable climate and long winter season many species are not well suited for the region, yet these species are still frequently used across the northeast. Another commonly cited variable resided in the DIYer's definition of what constitutes a "desirable lawn". For those striving to maintain the "perfect" lawn fertilizer was often seen as a critical component. However the need for fertilizer at the other end of the "desirable lawn" spectrum seems to be much less important. This is well described in a quote from a Business/ Industry Opinion Leader.

Those only trying to meet their community's standard of lawn care and provide a green and safe space for their family and pets would need to do no more than leave the grass clippings on the lawn when they mow the lawn.

If nothing else the necessity of fertilizer varies from not just community to community but from lawn to lawn. Variables such as age of lawn, soil conditions, grass species, preferred appearance of lawn are all influential factors.

An important finding was reported by one Business/ Industry Opinion Leader that claimed fertilizing probably isn't as important as many DIYers think. The perceived level of importance of fertilizer is thought to be greatly influenced by media driven by specifically marketing efforts, and should be a key part of outreach efforts.

4.3.2 *What is Being Recommended?*

It is important to note that a quarter of Opinion Leaders reported they don't recommend the use of fertilizer at all. Again with this answer as with the last, variation in fertilizer dependent on site conditions appear to guide much of the recommendations being made by Opinion Leaders. In many ways the site specific variations echoed responses to the previous question, with Opinion Leaders citing soil conditions and grass species as key factors. However there were also other influential variables taken into consideration such as the level of activity on the turf and the amount of sun versus shade exposure affecting the lawn. One Business/ Industry leader tailors the recommendation based on their assessment of the likelihood the DIYer will carry out their recommendation. Even with the recognition that the need to fertilize exists on a highly variable basis most dependent on site specific conditions, Opinion Leaders very rarely advocated for the use of soil tests. Some didn't believe current soil tests were able to measure levels of nutrients, while still others cited a reluctance on the part of DIYers to use a soil test to better inform their fertilization needs.

Although site specific variation was frequently mentioned, this was often the prelude to the actual fertilizer recommendation. The most common recommendation was a twice per year application schedule. The spring or early summer, coupled with a fall application was reportedly the most effective timing

for application. The rationale being that these are times of active root growth. Adding nutrients to turf during active root growth was also the basis for the significantly less frequently cited “four applications per year” recommendation, which is the most common fertilizing strategy on lawn product packaging. Even less often recommended was the “spoon feeding” approach often used in turf management at the professional level. This technique supplies the roots with a constant supply of nutrients by applying much less fertilizer much more frequently. This approach is thought to reduce the amount of leaching of excess nutrients due to the fact that the turf will be able to use all of the fertilizer. The reason given for rarely making this recommendation was the increase in time and labor needed to carry out this method. Due to the ease of application and the ability to slowly release nutrients into the turf, granular as opposed to liquid fertilizer was most often recommended. It was also expressed by a landscaper that there is specific equipment needed to efficiently apply liquid fertilizer to an entire lawn, the line of thought being most DIYers don’t have the expensive equipment needed for this method of application. Thus granular would be the more popular choice for home lawn fertilization practices. The use of organic fertilizers was mentioned, although infrequently. Fertilizers of this type were more often cited for their inability to address nutrient runoff issues than as an effective alternative.

The most popular amount of fertilizer recommended for use was 1lbs. of fertilizer per 1,000 square feet, with the only major variation being 2lbs. of fertilizer per 1,000 square feet. The most popular method of application was the

use of a broadcast spreader. However many Opinion Leaders also made mention that accurately calibrating broadcast spreaders was difficult and was based on uncertain variables such walking speed, how coarse the granular product was and the amount in the spreader's hopper. This again raises the issue of possible over application. One Opinion Leader sharing this concern cited a question often asked of them saying;

People often ask me “How many bags of fertilizer should I buy?”
rather than asking “How many pounds per square foot should I
apply?”

4.3.3 Variation Across Opinion Leader Groups: The Reflections of Audiences

Understanding the differences between Opinion Leader groups is an important aspect of this research and is a crucial component towards understanding their role as information vectors. There was distinct variation between groups and by examining these differences researchers can then begin to speculate about the messages that are likely being delivered to the DIYer population. This variation between groups is also important to understand because it further describes the differences in interaction each group has with the DIYer population.

Fertilizer being described as an important step in achieving a desirable lawn was the most popular response from both outreach and business Opinion Leaders. Both groups felt that fertilizing a lawn is an important step for most lawns, especially in lawn care practices aimed at achieving the perfect lawn as well as in

new turf management. Variation in the level of importance attributed to the use of fertilizer in achieving a desirable lawn was present in all groups.

Scientist/Researcher Opinion Leaders reported that the importance of fertilizer in lawn care is dependent upon the site's soil conditions and the species of grass planted. The recommendation to include clover in turf as a means of reducing the need for fertilizer was also unique to this group. Alpha and Outreach Opinion Leaders felt the importance of fertilizer use hinges on the levels of expectation the DIYer has for their lawn: the higher the expectations for the appearance of a lawn, the greater the need for fertilizer. Business Opinion Leaders had the least amount of variation in responses, consistently asserting that fertilizer is always an important step in lawn care. The small amount of variation within Business/ Industry Opinion Leader responses seemed to, like the Alpha and Outreach Opinion Leader, depend on levels of expectations.

A considerable number of Outreach Opinion Leaders felt that the DIYer population views fertilizer as being much more important than it actually is. The over-emphasis of fertilizer importance was seen as being driven by the media. Also worth noting is the fact that all groups had some Opinion Leaders claiming the use of fertilizer was not necessary at all, except for the Business/ Industry Opinion Leader group.

4.4 What are Opinion Leader's Perceptions of DIYer's Concern Over Lawn Care Practices and Fertilizer Use and Where do Their Concerns Lie?

The item addressing this research question appeared in the interview protocol as;

- ***Do homeowners have any existing concerns over fertilizer use?***
 - ***Are there any concerns about impacts on family and/or pet health?***
 - ***Are there concerns about the relationships between lawn care behavior and environmental quality?***
 - ***What are they most concerned about?***

During the interview process the lead question for this item was read exactly as it appears above. There was an unintended and perhaps telling response frequently given. In response to this question asking if they existed any concerns over fertilizer use a number of Opinion Leaders responded by mentioning concerns linked to product effectiveness. A number of results oriented questions emerged, including concerns over the effectiveness of a particular brand or product, the amount needed to be effective, what type of fertilizer is the most effective, what is the most effective application technique and so on. These result oriented responses were initially unanticipated given the original intent of the question to measure health and environmental quality related concerns. After guidance those that first interpreted the question in this manner were directed more towards the initial intent of the question.

Although these responses were unintended they may serve to underscore the rest of the findings collected from responses to this question. The general consensus was that there exists little concern over the use of fertilizers for turf care. This was often attributed to a lack of awareness of these issues. The lack of

knowledge regarding all aspects of lawn care seemed to permeate much of these findings, however not all of those interviewed shared this sentiment.

A number of Opinion Leaders felt there are levels of concern over fertilizer use amongst small subpopulations containing advanced knowledge of these issues such as garden clubs and shore front property owners. Other Opinion Leaders felt there is a growing number of DIYers beginning to take notice of these issues, while still others felt that these issues are being recognized today and that water quality issues were at the fore front of these concerns. After a complete analysis of the findings from this protocol item combined with other relevant findings was done, it would appear that most Opinion Leaders generally do not believe DIYers understand the environment impacts that can result from excessive fertilizer use. Any existing concern lies largely with pesticide and herbicide use rather than fertilizing. It was repeatedly expressed that the DIYer doesn't make the connection between their actions, taking place in their own backyards, and the quality of the environment on a larger scale. They believe that their actions are that of only one person and they don't make a difference. Another reason for this is captured in a quote from an Education/ Outreach Opinion Leader, "People tend to trust what is on the shelves. They feel that if it is sold in a store it must be safe to use as intended." Even though a lack of concern for these issues was the dominant theme, understanding where it does exist is a vital step for moving forward in dealing with this topic.

The next question appearing in the protocol asked if the Opinion Leader answers any questions concerning the use of fertilizer and water quality. Interestingly the findings here were mixed, with “Yes” being the most common answer, but only by a small margin. The most commonly reported response theme to these questions seemed to revolve around personal, family, and or pet health and safety. Some DIYers asking these questions were concerned for their well water quality, while others were interested in when it would be safe to recreate on the lawn or let the dog out into the yard after fertilizing. Opinion Leaders cited a dramatic increase in concern for water quality issues after a publicized event such as a fish kill or a beach closer due to an algal bloom. This concern was reportedly short lived, however and, would soon drop off. Overall, Opinion Leaders think DIYers have few concerns about environmental issues.

4.5 What are Opinion Leader’s Perceptions of the Barriers Preventing DIYers from Currently Engaging in More Environmentally Responsible Means of Lawn Maintenance?

Responses to this question yielded fewer trends, or similarities in response, than other questions. Still a number of valuable insights were discovered for researchers to consider when framing messages and choosing vectors for message delivery. Perhaps more importantly, Opinion Leader response set the stage for understanding this issue by pointing researchers in the right direction for further study in the survey effort. Understanding the barriers, whether perceived or real, towards accepting new behaviors is a critical stage for any outreach initiative

utilizing the tenants of community based social marketing. The specific barriers or benefits towards adopting any new behavior are unique to the circumstance in focus and thus always require analysis.

The protocol item used to gather this information asked,

- **What are the most common reasons DIYer's don't engage in more environmentally friendly lawn care practices?**
 - *Are these barriers "real" or perceived?*
 - i. *Cost*
 - ii. *Knowledge of alternatives*
 - iii. *Techniques for proper use*
 - iv. *Labor (Does using environmentally friendly alternatives mean more labor or less labor?)*

As mentioned earlier a whole host of opinions were expressed in response to this question. The messages and themes have been distilled to create a more useful and concise set of findings. The first finding is centered around the reoccurring concept of the amount of "effort" needed to carry out more environmentally sound lawn care. Opinion Leaders felt there would be an increase in the time needed to carry out these practices. Another component of the "effort" concept, labor, was also mentioned. These results are interesting given the wide variety of behaviors that can be considered acting in a more environmentally responsible manner some of which require less labor. Allowing nitrogen fixates such as clover to exist among turf species, or leaving grass clippings on the lawn after mowing can require less "effort". This provides a clear example of the "perceived" barriers that are likely to exist within the DIYer population. The same might be said for another issue highlighted by Opinion Leaders. The "cost" factor

was believed to be a strong barrier. Although a number of alternative fertilization strategies exist it was felt DIYers perceive many of these alternatives as being more expensive. A comment made by an Industry/ Business Opinion Leader captures this idea.

Many people are looking for the cheapest, easiest, fastest way to do things. Major brands focus on this and provide products that adhere to these concerns. Summer and seasonal homeowner's definitely fall into the category of wanting the fastest easiest form of lawn care

Overall the dominating theme was a lack of knowledge on the part of the DIYer. A number of short comings were cited as examples of this. For instance several Opinion Leaders claim DIYers don't understand the importance of cleaning up fertilizer that gets applied to impermeable surfaces such as driveways and sidewalks. Other examples included the use of combination products to treat a singular lawn care issue, the inability to know the proper quantity of fertilizer, and the unquestioning acceptance that following the direction on product packaging will prevent environmental degradation. In line with this point was another made by an Outreach/ Education Opinion Leader,

A lot of people are interested in doing the right thing yet they are receiving their fertilizing information from the point of sale.

This was said with the understanding that these sources of information will be less likely to bring attention to environmental issues. The presence of market driven information was also thought to be swaying the perceptions DIYers have

regarding the environmental safety of these products. A number of Opinion Leaders used the phrase “green washing” to conceptualize this point. The trust this type of marketing generates in certain brands and products was said to lead to a lack of concern over water quality or environmental issues. In short, there is a lack of recognition that environmental degradation is even linked to the use of these products.

It is recognized by most Opinion Leaders that point of purchase information such as product packaging represents the primary source of information for most DIYers. Beyond this most DIYers don’t pursue lawn care information any further. Those that do pursue further knowledge do so because of a desire to achieve an advanced level of lawn care. It was felt that these DIYers are more likely to have higher levels of concern for their lawn’s appearance than for pursuing fertilizing practices aimed at reducing environmental impacts. Further compounding the issue was the belief that those asking about the environmental impacts of lawn care are not likely to be those engaging in environmentally degrading lawn care practices, which highlights the need to reach different areas of the DIYer population. While a wide variety of barriers to environmentally responsible lawn care were identified a lack of knowledge among DIYers was a theme across them.

4.6 How do the Lawn Care Expectations as Reported by DIYers Differ From the Perceptions of the Opinion Leaders?

The following section highlights some of the important results from the survey effort to learn about DIYer's norms governing lawn care and their desires

and expectations for their own lawns. In recognition of the fact that the population of DIYers Opinion Leaders interact with represent a self-selected population, analyzing quantitative generalizable information from a larger more representative sample of DIYers is a crucial component of this project because of the ability to make accurate statements about this population. Analyzing the survey data in conjunction with the qualitative findings has revealed an interesting set of findings that has spurred new ways of thinking about the interactions between DIYers and Opinion Leaders, and how Opinion Leaders' perceptions of DIYers may be shaping the information they distribute. Understanding how this information exchange shapes the normative landscape of DIYer lawn care holds key implications for outreach creation.

To describe the lawn care expectations held by DIYers, factors used to measure and conceptualize these expectations are organized by topic. Each topic was represented and measured in the survey with a question or set of questions. An analyses of these responses as well as any supporting evidence from the qualitative piece are presented below. Special attention is paid to important subject matter where perceptions held by Opinion Leaders and responses given by the DIYer population differ.

4.6.1 DIYer Data vs .Opinion Leader Perceptions: The "Effort" Required to Obtain A Desirable Lawn

As previously stated "effort" is conceptualized as being a combination of time, money, and labor spent towards lawn care. These variables were highlighted

by Opinion Leaders a number of times as not only being limiting factors, preventing DIYers from achieving a desirable lawn, they were also identified as being influential variables of satisfactory lawn care. Opinion Leaders repeatedly reported DIYers' desire to spend as little time, money and labor to achieve a desirable lawn as being important to satisfactory lawn care. These statements also identify these variables as important barriers to more environmentally responsible lawn care. In one interview an Opinion Leaders responds to the question "What are the biggest challenges in lawn care to achieve the results homeowner's desire?" by saying "For some it is achieving the lawns they see on TV without putting in the time and effort necessary". The time involved in lawn maintenance was often singled out as being an influential factor in determining lawn care satisfaction and perhaps the most influential of the three.

Time and labor are the actual barriers to achieving the perfect lawn. A lot of people don't enjoy lawn work. People's expectations are set to high and reaching these goals can be difficult.

Unless you pay someone to do it, labor is the leading barrier. With labor comes the time investment.

Figure 4 shows the survey questions regarding feelings and opinions about lawns. This particular question set makes use of a 5-point Likert scale to measure DIYer attitudes towards time spent on lawn care. The results from this question differed from the perceptions reported by Opinion Leaders.

Figure 4: You and Your Lawn Care

Please indicate your level of agreement with the following statements regarding your feelings and opinions about your lawn.

	<u>Strongly Disagree</u>	<u>Disagree</u>	<u>Neutral</u>	<u>Agree</u>	<u>Strongly Agree</u>
A. I enjoy spending my time on lawn care.	SD	D	N	A	SA
B. The appearance of my lawn is important.	SD	D	N	A	SA
C. I want my lawn to look good enough to fit in with my community.	SD	D	N	A	SA
D. The appearance of my lawn reflects the type of person I am.	SD	D	N	A	SA
E. Fertilizing my lawn is an important step to achieving the type of lawn I want.	SD	D	N	A	SA
F. I believe most people are too concerned about their lawn's appearance.	SD	D	N	A	SA
G. I try not to let people and animals walk on the lawn.	SD	D	N	A	SA
H. I am satisfied with my lawn's appearance.	SD	D	N	A	SA
I. What my neighbors think about my lawn is important to me.	SD	D	N	A	SA
J. My lawn's main purpose is to provide a space for recreation.	SD	D	N	A	SA
K. Lawn care provides me with a way to be active outdoors.	SD	D	N	A	SA

As stated previously the responses to these survey questions were measured using the SPSS (Statistical Package for the Social Sciences) program. The frequency distribution of responses for "A." appears in Table 1.

Table 2: *Spending Time on Lawn Care*

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		

The results from this question differed from the perceptions reported by Opinion Leaders. Survey results indicate that more respondents than Opinion Leaders perceive enjoy spending time on lawn care. Consequently the added time that may be required for environmentally friendly alternative practices is not likely to be a significant barrier. This question however, doesn't fully capture all aspects of the "time" factor in determining lawn care satisfaction. Another question was added to supplement these findings and to measure another component of this influential factor.

If you perform your own lawn care:

A. About how many hours per week do you spend on lawn care?

- 0-1 4-5
 2-3 6-7 8+

B. Would you prefer to spend less time managing your lawn than you do now?

- Yes
 No
 No preference

In response to question “B.” fully two-thirds of respondents indicated either “no preference” or “no”. The responses to these questions created an alternative normative landscape than the perceptions held by Opinion Leaders. Whereas Opinion Leaders believe DIYers would prefer to spend as little time on lawn care as possible, many DIYers actually reported enjoying it and wouldn’t necessarily prefer spending less time engaging in it. Along with some other key findings, this discrepancy has shaped how researchers understand the interactions between DIYers and Opinion Leaders.

4.6.2 *Understanding the Desirable Lawn*

Having a clear understanding of the standards and aspects associated with a desirable lawn was important for outreach design. The developing lawn care strategy needed to be able to provide DIYers with a means of reaching these standards while employing more environmentally responsible means. Thus identifying these key attitudinal factors during the qualitative stage became an important goal of that stage of research. The factors DIYers use to judge a desirable lawn, as perceived by Opinion Leaders, were organized into a question set aimed at measuring the importance of each. Displayed in Figure 5 is the question set as it appeared in the survey.

Figure 5: Understanding the Desirable Lawn

Please rate the overall importance of each of the following lawn care issues.

	Not <u>Important</u>		<u>Neutral</u>		Very <u>Important</u>	
A. Having no weeds on my lawn	1	2	3	4	5	
B. Having my lawn as dark green as possible	1	2	3	4	5	
C. Having the grass be as thick as possible	1	2	3	4	5	
D. Having my lawn be clover free	1	2	3	4	5	
E. Having a pest free lawn	1	2	3	4	5	
F. Having a “golf course quality” lawn	1	2	3	4	5	
G. Having a safe lawn for the environment	1	2	3	4	5	

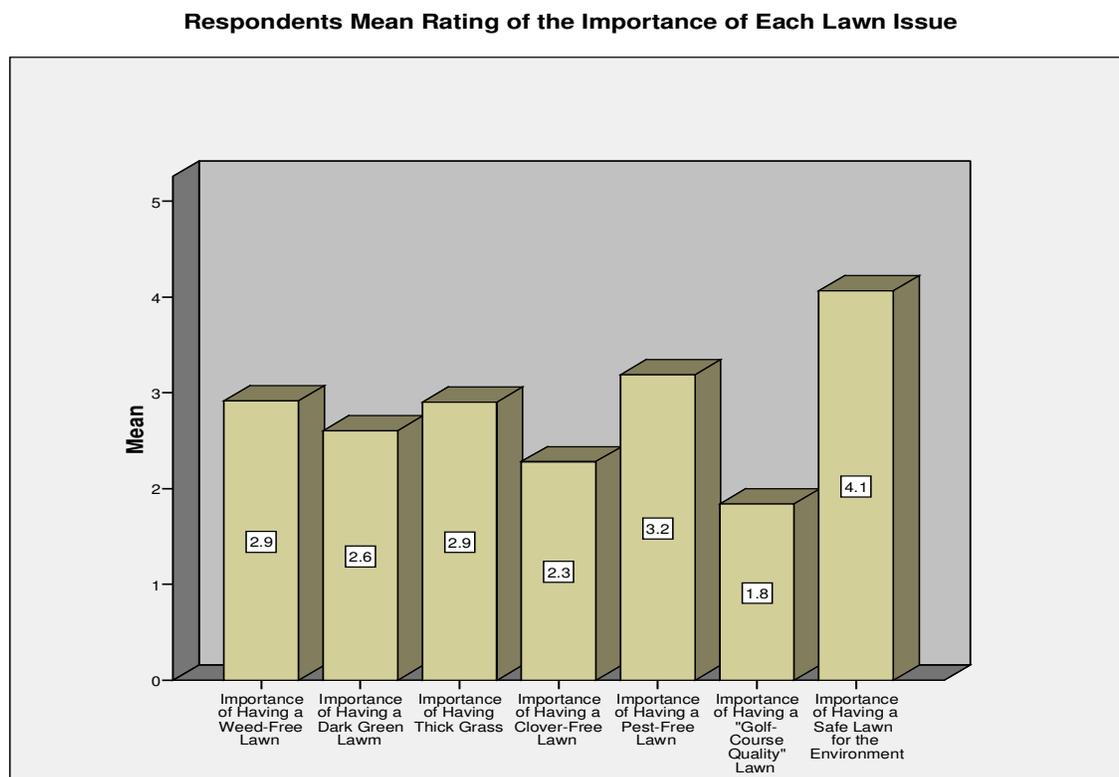
Table 3: Mean Rating of Importance of Lawn Issues

Table 3 compares the mean level of importance for each of the issues as perceived by respondents. What is especially noteworthy is that of the lawn attributes listed, the most important issue was having a safe lawn for the environment. This identifies an area where social norms can be brought to bear in an outreach campaign. This also identifies an important difference between the perceptions held by Opinion Leaders those reported by DIYers. The over arching theme for desirable lawn care described by Opinion Leaders seemed to center around achieving a particular appearance level, or finding a lawn care strategy that requires as little effort as possible while still meeting community standards in contrast, DIYers have a much broader set of criteria.

Also worthy of note is the data suggesting 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 by Opinion Leaders. This may be especially important in cases where species such as clover may be able to contribute, through nitrogen fixation, reducing the need for fertilizer application.

Having a “Golf Course Quality Lawn” is rated by DIYers as being the very least important of all the factors measured. These differences further develop an alternative set of lawn care norms than those perceived by Opinion Leaders. In addition, a surprising number of respondents assert that their lawns primary purpose is for recreation. This functional, rather than appearance defined standard

did not go unreported by Opinion Leaders yet this factor was largely under represented.

4.6.3 Existing Awareness or Concern for Environmental Issues Linked to Lawn Care

The question set in Figure 6 was designed to work in conjunction with several other items appearing the survey to evaluate the levels of knowledge and/or concern amongst homeowners regarding lawn care and environmental issues.

Figure 6: What Issues Matter Most?

What Issues Matter to You?

Please indicate your level of agreement with each of the following.

	<u>Strongly Disagree</u>	<u>Disagree</u>	<u>Neutral</u>	<u>Agree</u>	<u>Strongly Agree</u>
A. Using organic fertilizers addresses water quality issues related to fertilizer use.	SD	D	N	A	SA
B. Collectively, the lawn care practices of my neighborhood do not affect water quality.	SD	D	N	A	SA
C. I feel that members of a community have a responsibility to adhere to their community's standard of lawn care.	SD	D	N	A	SA
D. I have a good understanding of nutrient pollution issues from leaching and runoff.	SD	D	N	A	SA
E. Nutrients from leaching and storm water runoff from residential lawns and gardens are a major source of water pollution.	SD	D	N	A	SA
F. Agricultural practices are mainly responsible for water quality issues related to nutrient leaching and runoff.	SD	D	N	A	SA

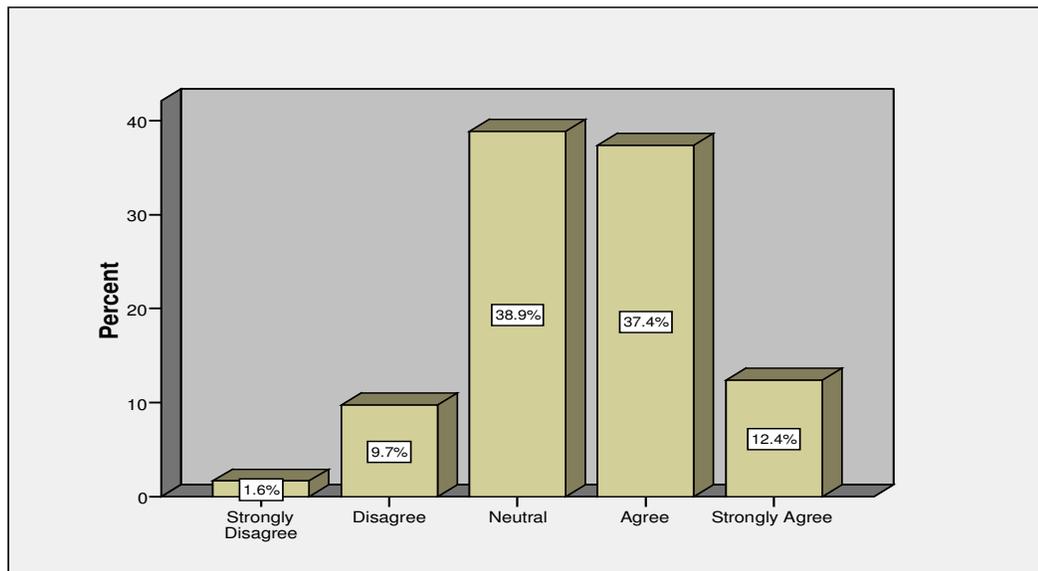
The results to this question set were varied making it clear that there exists a level of uncertainty within the DIYer population regarding lawn care's role in

water quality. This isn't dissimilar to the information gathered during the qualitative portion of this research. However unlike the data from the interviews, this data indicates that respondents do care about the appearance of lawns, but also recognize some environmental concerns exist and they are willing to explore alternatives to address these issues.

A misconception so common it merits inclusion in this section is shown in the chart below. As expected, the vast majority of respondents believe that using organics addresses issues related to fertilizer use and water quality, which is simply not the case.

Figure 7: Organic Fertilizers Address the Problem

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



Another important findings from this section examining critical information needs are results about 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. This represents another discrepancy in the attitudes held by DIYers regarding these issues versus that of Opinion Leaders. 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 as well.

Table 4: *Measuring Levels of Awareness*

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		

Several other items also indicate that there may be a higher level of recognition of these issues amongst the DIYer population then reported by Opinion Leaders. This research question was developed to understand where these crucial differences lie. The next chapter will explore the inaccurate perceptions of Opinion Leaders, as acting sources of information, may be effecting DIYer

attitudes, values and norms, and will also identify the most important implications for outreach creation resulting from these analyses.

CHAPTER V
Conclusions Derived From an Analysis of the Results:
Applying the findings

5. Revisiting the Issue

Non point source pollution is a major threat to the health of the environment. Its effects on water pollution are well understood and unfortunately many water bodies provide examples of NPS pollution's destructive nature. Algal blooms from excess amounts of nitrogen and phosphorous are leading to oxygen deprived dead zones, destroying life in many square miles of previously functioning aquatic ecosystems. Bays and estuaries traditionally thriving with a wide diversity of commercial fisheries no longer support these local communities in large part due to poor water quality. Beach closures impacting recreation are becoming more frequent. Indeed simply coming into contact with widely used bodies of water is now cause for health concerns.

NPS pollution poses a unique challenge that will require a variety of methods for successfully addressing this issue. Because NPS so often originates from our everyday activity, change at the individual level is crucial for reducing these devastating impacts. The origins of NPS are so diverse and so mundane that in many situations regulation and enforcement resulting from a top down strategy are largely ineffective and should not be seen as the only solution. There is a great and growing need to communicate the important role our individual actions play. This study explores and expands on important methods for achieving a greater

collective awareness and appreciation for the impacts our lawn care behaviors have on our water quality.

This chapter will focus on the conclusions derived from these findings. The purpose of this research is to develop conclusions that will aid in the effectiveness of outreach efforts through the application and advancement of community based social marketing techniques. The theory used to lay the groundwork for this research also guided the interpretation of results from the data collection. The conclusions discussed in this chapter are not only structured to reflect the applied nature of this research, but also attempt to add to the existing body of knowledge concerning the encouragement of environmental protection via focused outreach and education efforts. The following section begins with a concise review of the conclusions drawn from the findings. This review will link these conclusions back to the theory and principles used to guide this effort, as illustrating these connections clarifies the utility of the findings and sets the stage for their use.

The conclusion section of this chapter contains a series of recommendations for outreach development. These recommendations are derived from the perspective of applied research combined with current ways of thinking about outreach design, informed by the research conducted. In the future, Community Based Social Marketing efforts such as this will continue to grow in importance, as the need to effectively address environmental issues at the community level has never been more evident. The application and advancement of the principles of community based social marketing provide a means for achieving these goals. As

populations continue to grow in more rural regions traditionally rich with natural amenities and resources, so too does the need to effectively manage human impacts at the community level. Organizations leading these campaigns are often met with budgetary issues, reluctant audiences, messages from opposing entities and a whole host of other challenges. These challenges can oftentimes limit the scope or range of influence necessary to achieve desired project goals. This final section of this work also provides examples of how the approach used to guide these outreach recommendations could be applied to similar outreach efforts aimed at addressing a variety of community based environmental concerns. Throughout the discussion of these findings their connections with and implications for existing knowledge will be highlighted to best contextualize the applicability of the findings in future efforts.

5.1 Understanding the Findings

The research questions guiding the study were developed in a combined manner using both deductive logic stemming from existing theory and research and inductive reasoning during the course of data collection. As data from the interviews was collected researchers learned of certain specific findings that had a greater potential for guiding outreach efforts, and these topics were a focus in subsequent interviews. This in turn guided not only the survey creation, but also played a part in shaping focused and applicable research questions. How these conclusions can be applied to achieve project goals is discussed in these

summaries. These findings are then revisited in the conclusion of this chapter to complete this work.

I. What are Opinion Leaders' perceptions of the expectations held by DIYers regarding lawn care satisfaction?

Key findings for the design of education and outreach in response to this research question included Opinion Leaders' beliefs that:

- Satisfaction in lawn care is most often determined by the results. Result oriented factors include turf that is dark green, dense, and monocultured.
- Time, effort, and money are also perceived as important factors in desirable lawn care; of these “time” emerged at the fore.
- 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.
- There is a desire to achieve a “healthy lawn”. There likely exists many interpretations of what this means. Those DIYers desiring the Opinion Leader version of the “healthy lawn” (golf-course like) represent only one type of lawn care orientation that has emerged.
- Having a safe lawn for the environment was a goal believed to exist mainly among specific subgroups of DIYers.

5.1.1 Discussion of the Results

The protocol question; “*What do you believe most people are looking for in terms of being satisfied with their lawn care?*”, was originally intended to gather information about what aspects of carrying out lawn care are most or least desirable to the DIYer. This information would essentially identify Opinion Leader's perceptions of DIYer's attitudes and values enabling the development of a lawn care strategy that plays to these existing behavioral variables. This research

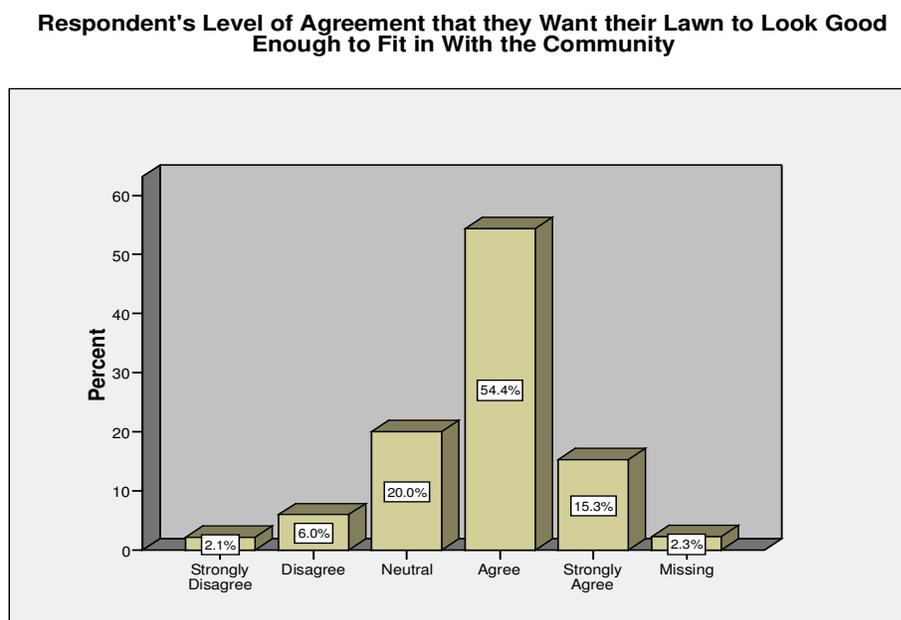
question was most often met with responses pertaining to the appearance of the lawn or results of the lawn care strategy. Although these responses describing the “type” or appearance of the lawn are closely linked to the original intent of the question, they do not describe the “lawn care” itself. The common interpretation of this protocol item suggested that Opinion Leaders perceive the need for a lawn care strategy to produce desirable outcomes, as being more important than the factors behind the strategy such as cost effectiveness, physical difficulty, environmental impacts, or a whole host of other factors that pertain to the actual work.

This directed researchers to learn more about the type of lawn DIYers desire. Several distinctive trends in responses emerged from this investigation. There is a commonly held belief by Opinion Leaders that DIYers share the desire to have the “perfect” lawn that resembles images from various media sources. It was felt by many Opinion Leaders that these expectations are unrealistic, and are rarely met. It is reasonable to assume that not meeting these lawn care goals causes a degree of frustration and disappointment on the part of the DIYer. This frustration with reaching current lawn care goals identifies a need that this project’s outreach message will be able to address.

This situation presents an opportunity to redefine the standards defining a desirable lawn. Opinion Leaders mention that although the “perfect” lawn may be the ideal for many, most DIYers are satisfied with an appearance that is in line with the standards of their community. This was supported by the survey data. This again underscores the powerful role social norms play in lawn care behaviors. It is

apparent that DIYers feel a pressure to adhere to community standards of lawn care. Conducting outreach at the community level and attempting to shift lawn care attitudes and values away from the “perfect” lawn to community standards would likely act to shift the focus of many DIYers’ lawn care desires. The graph in Figure 8 developed from the survey data supports this.

Figure 8: *Measuring Community Norms*



Other aspects of lawn care perceived as being influential on satisfaction such as the costs in time, money and labor were mentioned a number of times by Opinion Leaders in response to this and other protocol questions. Opinion Leaders’ responses to this inquiry it is felt that when compared to the outcome of a lawn care strategy these three factors were perceived as being slightly less important although influential. However Opinion Leaders who responded by identifying these issues suggest that they are likely to influence lawn care decisions, and thus merit closer

investigation. Out of these three factors the most influential was thought to be the costs in time needed to perform the lawn care practices, as two Opinion Leaders stated by;

For some it is achieving the lawns they (DIYers) see on TV without putting in the time and effort.

People expect to have the types of lawns seen on TV. People often expect to have a golf course in their backyards. This is difficult to maintain throughout the season and requires more time and work than they are willing to invest.

Having a safe lawn for the environment was a concern reported very infrequently. Although not identified as a major theme in this investigation of Opinion Leaders, it was said by some respondents that environmental concerns do exist among specific groups. These groups were identified as having advanced existing knowledge of these issues, and included groups such as Master Gardeners and landscapers. Opinion Leaders' assertion that DIYers as a whole have little concern for the environmental impacts resulting from lawn care is in itself an important finding.

5.1.2 Interpretation and Implications for the Development of Outreach and Education

The interaction between Opinion Leader and DIYer is an important one to understand. Opinion Leaders sought out as sources of information by the DIYer act to shape the normative landscape of lawn care. Understanding not only “what” information is being distributed to the public but also “why”, is an important step

for achieving project goals. Considering the goals of the segment of the population most frequently accessing Opinion Leaders, responses and other communications are likely to become tailored towards achieving this style of lawn care to aid those most often seeking this information achieve their lawn care goals. This can essentially act to reinforce the current, market driven, image of what the “perfect” lawn should be. This is also likely to result in lawn care recommendations that may not fit well with other segments of the DIYer population more accurately representing the majority.

Recognizing the Opinion Leader’s role as a source of information it becomes important to know what Opinion Leaders perceive as the type of lawn DIYers are striving to achieve. Many Opinion Leaders perceive the high input “perfect” lawn to be the goal of DIYers who seek information from them. However, when the quantitative data was analyzed it became clear that those seeking to achieve this high input look do not represent the majority of DIYers. A few of the Opinion Leaders interviewed also recognized this, and brought it to the attention of researchers. An explanation provided by Opinion Leaders suggests that the segment of the DIYer population most likely to seek out information regarding proper lawn care is likely to contain an over representation of those looking to achieve an idealistic turf appearance.

As indicated by survey results, the lawn issue identified as most important by respondents was having a lawn that is safe for the environment, yet this was not reported as being a major concern during interviews with Opinion Leaders. This is

a potentially encouraging finding that has several implications for outreach design. First, the finding identifies an area where social norms can be brought to bear in an outreach campaign. By clarifying the importance of this issue and identifying it as a concern shared by a majority of fellow community members to Opinion Leaders interacting with DIYers, researchers will be building on the best available information about turf care to make recommendations. Targeting Opinion Leaders as an audience for this message and also as a group that will take the message to those they interact with will make good use of existing and trusted information sources, enhancing this message's acceptance while simultaneously reducing the degree to which an influential information source, Opinion Leaders, reinforces the appropriateness of the pursuit of the "perfect" lawn.

5.2 Challenges in Lawn Care Satisfaction

II. What are the most important challenges in achieving lawn care satisfaction?

Two critical themes have emerged as being important challenges facing DIYers' attainment of lawn care satisfaction during the interviews conducted with Opinion Leaders. The first theme revisits the concept of the "perfect" lawn. Opinion Leaders frequently claimed that most of the challenges facing DIYers exist only for those seeking to achieve the "perfect" lawn. The second theme involves a widespread lack of understanding regarding almost all aspects of general lawn care among DIYers that prevents them from achieving satisfaction with their lawn.

Key findings for the design of education and outreach in response to this research question included Opinion Leaders' beliefs that:

- A lack of knowledge regarding lawn care issues in general was the most common response.
Specifically: -Lack of properly applying lawn care products (including water)
-Accurate problem Identification
- There is a lack of desire to obtain the information needed to remedy this lack of knowledge.
- Overcoming mis-set or unrealistic media expectations.
Including: -Achieving a mono-crop
-Consistent thickness
-Consistent color
- Site specific factors such as poor soil conditions, and proper grass species selection pose a significant challenge for reaching lawn care goals

5.2.1 *Guiding Lawn Care Expectations; "Healthy" as the New "Perfect"*

Opinion Leaders frequently expressed the belief that DIYers are driven by socially normative cues from a number of sources including media and marketing efforts, extreme examples of neighborhood lawn care, signage on lawns warning of recent chemical treatment, and a host of other subtle yet influential vectors that reinforce pressures to attain the well manicured, "perfect" lawn. Opinion Leaders asserted that these factors are a driving force in today's lawn care, and shapes the information they distribute. Redefining current lawn care goals through the creation of messages that make use of social norms will be essential for achieving project goals, and its effectiveness is supported by previous research (Festinger 1954 McKenzie-Mohr 2008, Goldstein, Cialdini, Griskevicius 2008) and by the findings of this project. The survey findings indicate that 69.7% of survey

respondents agreed or strongly agreed that they want their lawn to look good enough to fit into their community. The results from a different survey item show that nearly half (46.1%) of respondents agreed or strongly agreed with the assertion that community members have a responsibility to adhere to community standards of lawn care. At the same time 77.1% of respondents believe that having a lawn that is safe for the environment is important. Similarly 73.3% of respondents agreed that adopting an environmentally friendly lawn care practice is important for improving water quality. 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 supports the probable widespread acceptance of this idea, and further suggests that applying this sentiment in an outreach campaign may be appropriate.

However, there currently exist very few normative cues that identify the adoption of an environmentally friendly lawn care practices, an attitudinal factor, as being one that is shared by a majority of fellow community members. Framing environmental responsibility as a common standard in lawn care shared by 77.1% of fellow neighbors and community members is likely to resonate with a large portion of DIYers, and can be used to help recreate current norms affecting lawn care satisfaction.

This research has also provided support for a means of packaging this message in a way that should resonate with many DIYers. Opinion Leaders

frequently report that a common desire expressed by DIYers was to have a “healthy lawn”. Previously mentioned in this research was the commonly held belief that for the DIYer a healthy lawn consists of the top three appearance related factors (color, thickness, monoculture), which are often the result of a high input, well manicured lawn care regime. The project team and lawn professionals have the opportunity to redefine or shape the image of a “healthy lawn”, a desire already shown to be important, to one that better aligns itself with the most commonly reported lawn care desire, having an environmentally safe lawn. Table 5 and Figure 9 display charts derived from the survey data. The information provides a clear picture of existing lawn care values that can be used to promote environmentally sound lawn care messages.

Using other existing lawn preferences to promote outreach messages can build on currently held desires. The acceptance of the “healthy lawn” message may also be increased by linking this message to the supporting findings from another area of this research.

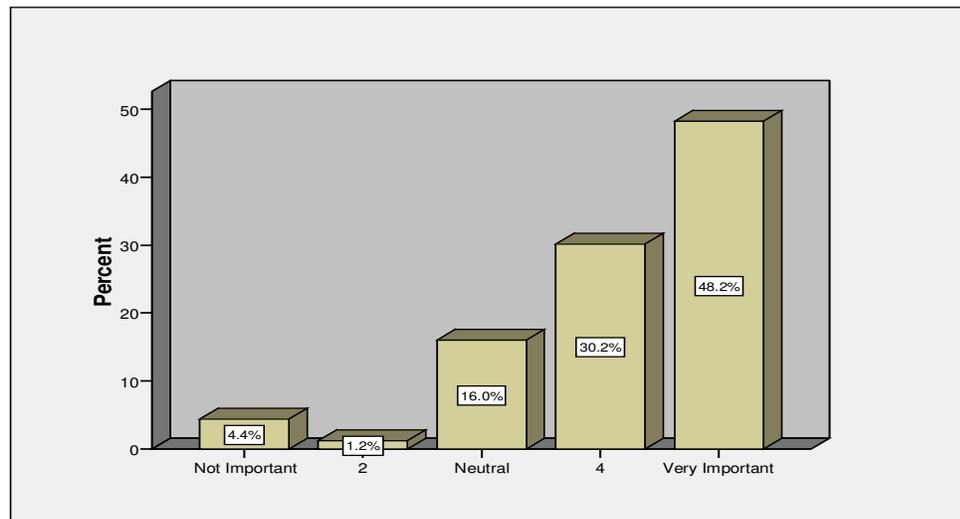
Table 5: Lawns are for Recreation

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		

Figure 9: Protecting Family and Pet Health

Importance of Protecting Family/Pet Health.



When seeking to understand DIYers desires and goals for lawn care, one question researchers asked survey respondents was what the primary use of a lawn

was. A surprising number of respondents (68.2%) assert that their lawn's primary purpose is for recreation. This functional, rather than appearance defined standard, suggests that embedding messages linking the personal safety and health benefits that result from the responsible application of fertilizer will also resonate with DIYers.

5.3 Addressing the Lack of Knowledge in Lawn Care

Perhaps not surprisingly, given the nature of their interaction with DIYers, many Opinion Leaders perceive this issue as being an important challenge in DIYers' efforts to achieve satisfaction with their lawn care. If not guided by some basic principles a number of the most simple lawn care behaviors can easily result in a lack of intended results, often resulting in frustration on the part of the DIYer. An example of this would be fertilizing during periods of non-growth. During times of slower seasonal growth turf is unable to fully utilize the available nitrogen and phosphorous in fertilizers. It is well-documented that the excess nutrients may migrate off site (Sims et al., 2002; Morris et al., 2006, Maguire and Sims, 2002). This serves to underscore another unfortunate consequence of a lack of basic lawn care information, the possibility for environmental degradation. Below is a bulleted list of basic lawn care topics DIYers lack adequate knowledge about according to Opinion Leaders that are particularly important for the design of education and outreach.

- Mowing at a slightly elevated height can greatly reduce stress on the turf, and consequently the need to fertilize.

- Fertilizing only during periods of active growth will save time, money and wasted effort while reducing the likelihood of nutrient migration.
- Not watering immediately after fertilizer application will also have similar benefits. (Some Opinion Leaders mentioned DIYers will feel the need to “water in” the fertilizer).
- Storing fertilizer rather than using the entire package has a great potential for reducing over fertilization (41.2% of survey respondents indicated that they purposefully use the entire package to avoid surplus).
- Allowing clover to permeate the yard will eliminate the need to treat for it while naturally improving nutrient levels in the turf through fixation.

By including these specific recommendations into message content researchers would likely address, in a meaningful way, some of the most wide spread lawn care problems affecting water pollution from lawn care. This could act as an effective way to reduce the NPS pollution from those who hold relatively little concern for environmental quality, but are interested in achieving a variety of lawn care goals.

5.4 Fertilizer Use and DIYer Expectations

III. What are Opinion Leader’s perceptions of the importance of using fertilizer for reaching DIYer lawn care expectations?

Opinion Leaders asserted that fertilizing is important for achieving a desirable lawn twice as often as those who said it was not important for achieving desired results. A small portion of those went so far as to say fertilizing is a very important part of reaching lawn care goals. Variability in the importance of fertilizer was very common to hear, even among those advocating for its

importance. The bulleted items below list the factors guiding the variability in need for fertilizer application as reported by Opinion Leaders.

- Age of the turf
- Current soil conditions
- Species of turf
- Levels of lawn expectations
- Community standards of lawn appearance
- Location of turf, claiming that areas with shorter growing seasons will need to take full advantage of that shorter window.

Despite the many factors affecting the need for fertilizer use it was felt that very seldom are these factors taken into consideration before the application of fertilizer by DIYers. Many Opinion Leaders felt DIYers are simply unaware of the factors affecting variability in the need to fertilize. This again points to the belief among Opinion Leaders in a lack of basic turf knowledge on the part of the DIYer. Widely marketed and distributed fertilizing products focus on creating easy to follow blanket recommendations. The survey found that most people using fertilizer are getting their information from the product's packaging. These recommendations remain constant regardless of site specific conditions, which Opinion Leaders have identified as being very influential in the necessity of fertilizer use.

5.4.1 *Outreach Implications*

This issue highlights another area where a lack of knowledge regarding proper lawn care may be impacting water quality. A central focus of this outreach effort should urge DIYers to think critically about the conditions present in their lawn. Rather than basing fertilizing decisions on the blanket recommendation found on product packaging, annual traditions, or advice from neighbors DIYers need a source of accurate and reliable information. If nothing else this finding provides further support for the need to develop this outreach. A brief set of guidelines, drawn from the bulleted points above, asking DIYers to consider these basic questions before applying fertilizer would do well address this lack of knowledge.

Equally important, if not more so, is the need to inform Opinion Leaders of the need to communicate about variables affecting the need to fertilize and various lawn care goals. As described previously Opinion Leaders often perceive the “perfect lawn” as the type of lawn most often desired by DIYers, and to achieve this style of lawn fertilizer application is essential. This presumably shapes the information they deliver towards aiding DIYers. Informing Opinion Leaders of the findings from this research will allow them to think more critically about the necessity of fertilizer use for the individual DIYer seeking advice. Opinion Leaders would be able to better serve DIYers by first understanding their lawn care goals, values and attitudes. As was discovered from the survey data in many cases Opinion Leaders would likely learn the high value many place on having a safe and

environmentally friendly lawn care regime. They could then tailor their recommendations to better reflect these commonly held values enabling DIYers to best reach their lawn care goals.

5.5 Variation of Importance of Fertilizer Use Across Opinion Leader Groups

IV. How do perceptions concerning the importance of fertilizer application vary across Opinion Leader groups?

Different Opinion Leader groups (Outreach/Educator, Scientist/Researcher, Industry/Business, Community Expert/Alpha Neighbor) attributed different levels of importance to the use of fertilizer by DIYers. Understanding the differences between groups provides a way to better understand their attitudes and beliefs about this issue, as well as some reasoning as to why they hold the opinions they do. This is important to learn about because these Opinion Leaders can be accurately thought as influential shapers of opinion.

The following is a bulleted list of the important trends in responses from Opinion Leader groups to questions about the importance of fertilizer use for the design of education and outreach. These trends are described in Chapter 4 and are organized here to facilitate a discussion of their implications for outreach.

- Variation in the level of importance attributed to the use of fertilizer in achieving a desirable lawn was present in all groups.
- All Opinion Leaders asserted that the importance of fertilizer in lawn care is dependent upon the site's soil conditions and the species of grass planted.
- A considerable number of Outreach Opinion Leaders felt that the DIYer population views fertilizer as being much more important than it actually is.

- All groups had some Opinion Leaders claiming the use of fertilizer was not necessary at all, except for the Business/ Industry Opinion Leader group.
- Fertilizer use described as being an important step in achieving a desirable lawn was the most popular response from both Outreach and Business Opinion Leaders.
- The recommendation to include clover in turf as a means of reducing the need for fertilizer was unique to the Outreach/ Educator group.
- Alpha and Outreach Opinion Leaders more often felt the importance of fertilizer use hinges on the levels of expectation the DIYer has for their lawn.
- Business Opinion Leaders had the least amount of variation in responses, consistently asserting that fertilizer is always an important step in lawn care.

5.5.1 Implications for Outreach

Multiple results from this research indicate the need to consider the role Opinion Leaders play in shaping lawn care behaviors. As acting sources of information it becomes clear that informing, or educating, Opinion Leaders on many of the conclusions derived from the survey data would be an effective way to accomplish project goals while allowing them to better meet the needs to the larger population. Informing Opinion Leaders of the lawn care values, attitudes, and norms of the larger population of DIYers would allow Opinion Leaders to develop a more accurate conceptualization of DIYer's needs, and could be instrumental in reducing the reinforcement cycle for the pursuit of the "perfect" lawn.

The differences highlighted in this research question suggest that some of these findings and messages will likely be received differently among different Opinion Leader groups. For example the largely pro-fertilizing Business/Industry

group will likely be much less willing to advocate for the use of alternative fertilizers than the Outreach/Educator group. However certain themes or messages would be more likely to resonate with all Opinion Leaders, such as sweeping up off target fertilizer that is accidentally applied to impervious surfaces. A list of these themes and the Opinion Leader groups they would best resonate with appears in the conclusion of this chapter.

5.6 Perceptions of DIYer Held Concern Over Fertilizer Use

V. What are Opinion Leaders' perceptions of DIYer's concerns over lawn care practices and fertilizer use, and where do these concerns lie?

The following is a bulleted list of the most important trends in responses from Opinion Leader groups to questions about DIYer's concerns related to lawn care and fertilizer use for the design of education and outreach.

- Several Opinion Leaders felt that homeowners do not consider in any form of lawn care to be environmentally damaging at all.
- A lack of existing concerns about fertilizer use among DIYers was commonly asserted to exist by respondents.
- Some concern about fertilizer use does exist among a small number of DIYers.
- Within this small group of DIYers the concern exists mainly within specific groups already having an advanced knowledge of fertilizer (such as gardening clubs, etc.)
- Although there is currently only a small amount of concern, awareness of the impacts of lawn fertilization is believed to be growing.
- Pet and family health concerns were among the most mentioned responses. The question often asked of Opinion Leaders, "When is it safe to go back on the grass?" captures the essence of this concern.

- Few Opinion Leaders report that varying levels of environmental concerns were present. The concerns included the water quality of a specific water body, and more commonly, personal well water.
- Results oriented questions were common as well, and these included concerns over the effectiveness of a particular brand or product, the amount needed to be effective, what type of is the most effective, what is the most effective application technique.

Many Opinion Leaders shared a common sentiment that there exists little to no concern among DIYers over the use of fertilizers. The reasons provided frequently involved a lack of awareness of the links between fertilizer use and environmental impacts. Based on this information provided by Opinion Leaders there exists strong support for the inclusion of messages aimed at educating DIYers on the basic relationship between fertilizer use and impacts on water quality. Subsequent findings suggest that clarifying the link between these impacts and the fertilizing that occurs at the individual level has an effect on water quality, as many DIYers do not see their individual actions as having an effect. These messages will likely resonate well and reinforce existing concern. Although this group is small the specific segments of the population having these concerns including Master Gardeners or similar groups with an advanced understanding of these issues that are likely to be influential in shaping opinions. Developing messages linking these concerns with specific water bodies, family and pet health, as well with person well water will likely resonate with a wide population of DIYers. Although care must be taken when addressing this issue, advising DIYers to think critically about the

fertilizer product they buy and the blanket recommendations often appearing on product packaging.

Supporting these assertions are quotes from Opinion Leaders providing examples for some of the reasons a lack of concern is present in the greater public.

One Opinion Leader states;

People tend to trust what is on the shelves. They feel that if it is sold in a store it must be safe to use as intended.

Still another Opinion Leader claimed,

The research concerning this issue seems to be going back and forth on the relationship that fertilizer has with human health and environmental quality. This is sending conflicting messages out to the DIYer community.

The trends described above hold true for many Opinion Leaders. The survey results providing data from DIYers themselves tell a different story. The following chart shows that many DIYers agree that following environmentally lawn care practices is important for improving water quality.

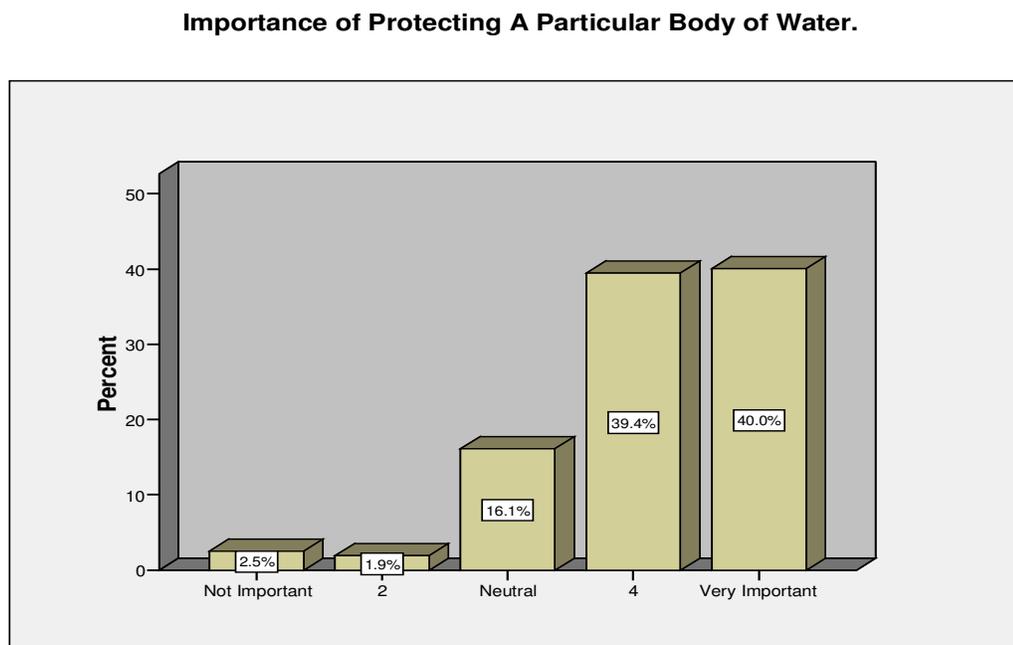
Table 6: Importance of Environmentally Responsible Lawn Care

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		

While the subject of the questionnaire may introduce some biases, the results indicate that some people are in fact cognizant of these issues and care about them if they understand them. Similarly, responses to the question asking if respondents recognized that the collective lawn care practices in their community may impact water quality indicate a level of awareness that is not commonly perceived by Opinion Leaders. Two other survey results further support this finding, 30.5% of respondents believe their work or business is economically dependent on the quality of their watershed. Additionally a large majority of respondents find it important to protect a particular body of water as shown in Figure 10.

Figure 10: *Protecting Particular Bodies of Water*



The differences between the survey findings and the perceptions held by Opinion Leaders are quite distinct. A reasonable conclusion for this is, again, the population of DIYers Opinion Leaders most often interact with likely affects their perceptions of the greater population. This doesn't necessarily devalue the findings from either the qualitative or the quantitative pieces of this research, instead, it highlights the important of audience segmentation in message design and delivery and the need for caution in generalizing from direct experience with a subpopulation of DIYers.

5.7 Identifying Barriers Towards Environmentally Responsible Lawn Care

VI. What are Opinion Leaders' perceptions of the barriers preventing DIYers from currently engaging in more environmentally responsible means of lawn maintenance?

Several consistent trends in Opinion Leaders' responses about barriers to DIYers engaging in more environmentally friendly lawn care that are important for the design of education and outreach emerged in the research:

- The increased investment of time required to engage in alternative practices was perceived to be a significant limiting factor in using alternatives.
- A perceived increased in labor as a barrier was also frequently mentioned.
- The financial cost of alternatives was perceived to be a strong barrier to their use. Opinions about whether this barrier is real or perceived varied amongst Opinion Leaders. This could be due, in part, to the variety of different fertilizing alternatives.
- The most important of these findings justifies the need for significant education and outreach; Lack of knowledge was the leading reason Opinion Leaders believe most DIYers don't engage in more environmentally friendly practices. Specifically, a lack of knowledge was reported in regards to proper fertilizing techniques including a tendency to unknowingly over apply.

- Despite the lack of knowledge perceived to exist among DIYers, many Opinion Leaders believe there is a lack of willingness to pursue more complete knowledge. This may be related to lack of concern with or awareness of environmental impacts from over-fertilization.
- Oftentimes the concern for a desirable lawn outweighs environmental concerns.
- The influences of marketing and many other social forces, including neighbors, is believed to result in less environmentally responsible lawn care practices by Opinion Leaders. The phrase “green washing” was used in terms of market driven messages.

5.7.1 Addressing the Barriers

The principles of community based social marketing highlights the need to identify and address the barriers that prevent people from acting on new information. There are a wide variety of possible environmentally responsible messages that can be used in an outreach campaign targeting this source of NPS the most effective of these are going to directly address these barriers. Identifying these barriers will likely prove to be one of the more fruitful endeavors for not only increasing message acceptance but for turning message acceptance into practice. The reasoning behind this is that many of the barriers identified in this research are misperceptions of what environmentally responsible lawn care entails.

5.7.2 Identifying Critical Information Needs Among Both DIYers and Opinion Leaders

A lack of accurate lawn care knowledge among DIYers permeates many of the responses Opinion Leaders gave to a variety of protocol items. This was found to be especially true in the responses to protocol items designed to measure barriers preventing DIYers from practicing more environmentally responsible lawn care.

Opinion Leaders need to be informed of several key issues. The first would be to inform them of the alternative lawn care strategies being suggested by this project. By becoming familiar with these techniques they will understand that many of these recommendations do not require an increase in time, money or effort needed to carry them out. Another important theme would include messages developed from the survey data suggesting that DIYers don't necessarily view an increase in the time it takes to carry out a lawn care strategy as being a significant barrier towards engaging in environmentally friendly lawn care. Often Opinion Leaders reported being reluctant to distribute lawn care information they felt the DIYer wouldn't likely to carry out, as this quote clearly states;

Any recommendations I make are largely based on whether or not they (DIYers) are going to follow through with them. If I suggest something that takes a lot of time people won't use the information. Giving them something that they will use is better.

The diversity and variety of lawn care recommendations developed for this outreach effort addresses many of these barriers, real or perceived, towards adoption. Informing Opinion Leaders of both the lawn care desires held by most DIYers and the lawn care recommendations developed for this project could increase their acceptance of project recommendations and willingness to use these messages in their outreach. Different DIYers and Opinion Leaders alike will have varying levels of acceptance of this projects messages and goals. Understanding that not everyone will practice or distribute all the projects recommendations is key. Delivering recommendations that resonate with the largest amount of people

will achieve greater levels of project success. This is where identifying the differences among Opinion Leader groups will be most helpful. For example, based on interview responses advocating for alternative or non use of synthetic fertilizers will not likely resonate with the Business/Industry Opinion Leader group. What would work better for this group having learned from their responses to the interview protocol, as well as the survey, would be advocating for such messages as cleaning up of off target fertilizer from impervious surfaces and the proper timing of application.

Building on these findings is essential for project success. A full set of Opinion Leader and DIYer message recommendations are explored in full in the final conclusions section of this chapter.

Final Conclusions

Focused Recommendations for Developing Outreach Aimed at Reducing the Negative Water Quality Impacts of Home Lawn Fertilizing Practices

6. Final Conclusions and Take Home Messages

The social science research conducted for the *Changing Homeowner's Lawn Care Behavior to Reduce Nutrient Losses in New England's Urbanizing Watersheds* USDA funded project has produced a large body of applicable information for achieving project goals, some of which are discussed in this work. Social science theory and techniques have guided the interpretation and informed the application of this data to project efforts. This project specifically targets the behaviors of do-it-yourselfers (DIYers) of home lawn care in New England, but there is potential to expand the utility of this method for use in similar projects aimed at reducing the presence of NPS from a variety of sources. The applied theory and systemic approach taken here builds upon the assertion that understanding the underlying drivers behind behavior linked to the presence of NPS is crucial for creating an effective outreach design. A critical component of this process was exploring the role leaders in lawn care opinion have in shaping the values, attitudes, social norms, and ultimately behavior of New England's lawn caretakers. Identifying those considered to be leaders of opinion as targets of outreach efforts provides these projects with a means of shaping the normative landscape affecting DIYer decisions.

The framework used to approach this issue incorporates and supplements the principles of Community Based Social Marketing (McKenzie-Mohr, Smith 1999). Applying and enhancing this set of principles creates a framework for addressing similar issues in today's society. Shaping the underlying drivers of behavior holds much promise for behavior change, and should be considered a superior method then simply providing audiences with information. Using the Theory of Planned Behavior as a model for identifying and describing influential drivers of behavior has a rich history of support that lends itself in support of the utility of this approach.

This study concludes with a listing of the outreach recommendations that were developed as a result of this works findings. These recommendations are organized to provide easy access for reference purposes. To provide clarity and direction for their use a discussion detailing their application and advantages follows this listing. The first section details important themes and message discovered to be important for delivering to DIYers. The second section explores the role Opinion Leaders play and what recommendations and messages that would best serve them.

6.1 Recommendations for the Design of DIYer Focused Outreach: Closing the Knowledge Rift by Addressing Basic Informational Needs

The following section lists recommendations for addressing a lack of basic lawn care, fertilizing and water quality knowledge;

- Don't use it all: Using up all the fertilizer to avoid storing it creates problems not solves them. Grass can only use so much nutrient the extra can damage your water quality.
- Mow at a slightly higher height: This reduces the stress on the turf and will result in a hardier crop needing less fertilizing.
- Clean up off target fertilizer: Leaving fertilizer on impervious surfaces such as driveways and sidewalks will be washed down storm drains and directly into nearby water bodies.
- Know the size of your lawn: Avoid wasting money and harming the environment by buying and applying too much fertilizer by understanding how much your lawn needs before applying.
- Leave your grass clippings: This will return nitrogen back into the lawn and will reduce your need to fertilize.
- Use clover on your lawn: Clover acts as a nitrogen fixate naturally supplying your turf with added nitrogen.

These messages provide the easy and simple direction needed to reduce some of the impacts fertilizer use has on water quality. Many of these points were explored in the survey and were found to be highly acceptable to most DIYers. Their ease of implementation and reported degree of acceptance suggest these few recommendations could represent a basic take home message.

6.1.1 *Making use of Existing Social Norms: Message Framing*

These findings from the survey effort serve to highlight several areas where social norms can be brought to bare in outreach efforts.

- “Fitting in” is important to most respondents with 69.7% agreeing or strongly agreeing 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.
- 30.5% of respondents believe their work or business is economically dependent on the quality of their watershed.
- 77.1% believe that having a lawn that is safe for the environment is important.
- 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.
- Protecting family and pet health is important or very important to 78.4% of respondents.

Advertising these concerns and desires as being commonly shared will help to bring attention to the “healthy” lawn and comprise an important component of efforts to stimulate behavioral change through outreach efforts. There exist many reinforcing images of the high input lawn including many media driven efforts. However, there exist very few reinforcing messages that accurately represent more commonly held lawn care values such as environmental safety and the importance of reducing water quality impacts. Using these messages in efforts to affect the content and nature of social norms of lawn and lawn care researchers can begin redefine the image of the “healthy lawn”.

6.2 Recommendations for the Design of Opinion Leader Focused Outreach

The perceptions Opinion Leaders hold regarding DIYer lawn care attitudes and values have been found to contain some misconceptions about DIYers as a whole. This may be due to the nature of these two groups’ interactions, as Opinion

Leaders sought out for their expertise on this subject matter most often interact with, and address questions and concerns from, a self selected group of DIYers. The frequency and nature of these interactions may influence the perceptions of the DIYer audience held by some Opinion Leaders, ultimately shaping the information they distribute to best meet the needs of those most often seeking advice. Informing Opinion Leaders about many of the findings from this research will allow them to better serve DIYers by presenting a more accurate picture of the entire DIYer population. This in turn has significant implications for improved water quality and the reduced need for lawn fertilizing.

6.2.1 Common Misconceptions Held by Opinion Leaders

The five most common misconceptions held by Opinion Leaders are:

- Satisfaction in lawn care was perceived to be most often only determined by the results.
- The “perfect lawn” (dark green, dense, and monocultured) is the most commonly desired type of lawn.
- Time, effort, and money were perceived as leading factors determining desirable lawn care; of these “time” emerged at the fore.
- Environmental concerns related to lawn care and water quality weren’t thought to be common among DIYers.
- Having a safe lawn for the environment was a goal believed to exist only among specific select groups of DIYers.

The results of this study show that this list is accurate. These findings reveal a number of useful insights that support the need for a reform in the perceptions held by Opinion Leaders regarding DIYers. Recognizing DIYers’

existing willingness, and in fact desire, to be environmentally friendly in their lawn care practices provides direction for Opinion Leaders to better meet their needs.

Taking heed of these concerns allows them to better address the concerns DIYers commonly reported as being important in making lawn care decisions. Opinion Leaders can provide a means for DIYers to achieve a desirable lawn while promoting a turf management strategy that is environmentally sensitive and will protect water quality while educating some on the importance of these issues.

Findings from this research provide a means for framing this and promoting this cleaner style of lawn management. Evidence suggests that there is a need to redefine what a “healthy lawn” is, as having a healthy lawn was a commonly held desire by many DIYers. 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, however among DIYers the idea of what constitutes a healthy lawn is interpreted on a highly variable basis. While it 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 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. This style of management doesn’t meet many of the lawn care concerns and desires reported by most DIYers. This style of high input lawn care isn’t conducive to the

most frequently reported use of the lawn as a recreational space for family and pets, a function rather than appearance related factor. To meet the needs of the greater DIYer population Opinion Leaders should promote a new version of the healthy lawn that more accurately reflects the more common desires and utility of lawn space. This could take the form of lawn care that strives to meet neighborhood standards of lawn appearance while protecting water quality as well as family and pet health and emphasizes functionality and health rather than appearance.

6.2.2 Opinion Leaders Role as Message Vectors

As was reported, variation in the level of importance attributed to the use of fertilizer in achieving a desirable lawn was present in all groups. However, trends within groups of Opinion Leaders have emerged and have been interpreted as being indicators of varying levels of likely acceptance of project goals and messages. Not all experts in the realm of turf management are convinced of the need to manage fertilizer use for water quality. Whether driven by sales, meeting high customer expectations, or simply the belief that fertilizer use does not impact water quality, different groups of Opinion Leaders are likely to be receptive to different messages. Below are recommendations for the different groups. Opinion Leader focused outreach recommendations are based on extensive interactions with Opinion Leaders across New England, interpretation of their recorded responses, and emergent trends in response to protocol questions.

Outreach/Educator

This group is largely comprised of Cooperative Extension faculty and staff and are the most likely to be accepting of project goals, messages and recommendations. There is a need to inform many in this group of the lawn care desires and water quality concerns held by many DIYers with whom they may not regularly interact, as they frequently described fertilizer as being an important step in achieving a desirable lawn. These Opinion Leaders do seem to be open and accepting of alternative fertilizing practices and hold the belief that alternative fertilizing practice will often meet DIYer lawn care expectations. This may be due to the reported belief that a considerable number of Outreach Opinion Leaders felt that the DIYers view fertilizer as being much more important than it actually is, debunking this myth could also reduce the perceived need to apply.

Scientist/Researcher

This group can best be described as being split on the issue of environmental concern linked to home fertilize use. Where all were cognizant of the debates over these issues, some expressed beliefs that this problem is being exaggerated. Regardless of their interpretation of the evidence appeals for thinking about fertilizer application more critically rather than based on tradition or past behaviors will resonate with this group. This group may accept messages that push for considering site-specific conditions such as age of turf, soil conditions, species of grass present, DIYer expectations, and other factors that should be accounted for

in the creation of fertilizer regimes. This better informed approach should result in a significant reduction of fertilizer run-off resulting from the over-application of fertilizer.

Industry/Business

This Opinion Leader group is far less likely to be open to certain assertions and goals for changes supported by this project such as alternative fertilizer practices or advocating for nonuse. Many in this group feel professionally and financially obligated to strive for the “perfect” lawn to meet clients’ expectations. These Opinion Leaders had the least amount of variation in responses, consistently asserting that fertilizer is always an important step in lawn care. However, opportunities to stimulate change by working with members of this group do exist. Concerns about the impacts of over fertilization on water quality are present in a subset of the DIYer population and is growing according to some respondents, and as was discovered in the survey, adhering to and promoting such practices as cleaning up mis-applied fertilizer can enhance the image of intensive care regime proponents and followers without reducing their financial bottom line. Some in this group felt often times the number of treatments or visits to a property was a very influential factor in client satisfaction, so soil testing visits and site needs assessment visits could take the place of additional fertilizer applications and could actually result in a more appropriate site specific lawn care plan, and also constitute

an example of a shift in practices that can improve environmental quality while not impacting service providers need for profit.

Community Expert/Alpha Neighbor

The low number of Opinion Leaders in this group makes reporting on the trends discovered here challenging to do with a high degree of reliability. This influential Opinion Leader group was the most difficult to identify for interview purposes. However they will be reached by this projects outreach messages a DIYers. This is an important group to reach, however, as many are leaders of opinion and considered influential at the neighborhood level. Future research could aid in identifying these individuals and tailoring messages towards this group.

6.3 Final Conclusion

Overall the results of this research can be interpreted as very encouraging for the likelihood of success in outreach programs designed to affect lawn care practices to improve water quality that incorporate the findings reported here. The size and scope of this effort has produced extensive and reliable data on lawn care and water quality issues that were previously left to speculation. Survey and interview data were gathered throughout New England from a variety of sources, and as a result the research reported here was able to produce information more accurately describing those residents lawn care activity then those immersed in various aspects of lawn care.

Where effective lawn care and lawn appearance are important in US culture, some people also recognize the negative impacts on our environment and demonstrate higher levels of environmental concern than expected. Many DIYers and Opinion Leaders alike express a willingness to explore alternatives to traditional fertilizing to address these issues, so the information reported here on how to achieve such changes is an essential part of creating successful efforts to do so. It is especially important to note the high quality of work this collaborative effort has produced. The quality of this data, the resulting outreach design, scientifically grounded turf care recommendations, and many other outcomes from the project are the direct result of the time, dedication, and thoughtful input from a well-coordinated interdisciplinary project team. This CSREES integrated program is designed to foster truly interdisciplinary work, and in this case the funding has produced a depth and breadth of knowledge gained through focused scientific pursuit that wouldn't otherwise be possible. The entire project team is deserving of recognition for their contributions and should be viewed as a successful example of research of this type, which represents an excellent model for future efforts to address NPS issues.

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