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Executive Summary

The role of education efforts in reducing nutrient loads in the Chesapeake Bay and other parts of the country is an issue which has stirred increasing interest in recent years. Often in urban areas, public education is an important tool in achieving nutrient reduction goals. The Center for Watershed Protection has recently completed an initial assessment of nutrient education programs, as well as a survey of Chesapeake Bay residents behaviors and attitudes regarding three practices (lawn care, septic system maintenance, and pet waste disposal) that contribute nutrients to local waters. The results of this survey, together with a survey of fifty nutrient education programs from around the country, provide us with a profile of current nutrient education efforts, their effectiveness at reaching residents, and what outreach methods work best to attract attention and spread the nutrient management message. A number of recommendations for creating and enhancing nutrient education programs have been developed using the project results and comparisons with other recent attitude surveys.

The first step in effective nutrient education is to heighten residents' basic watershed awareness. Several studies have found that residents are not acquainted with concepts like what a watershed is and how stormwater runoff is related to water quality. When the connection between watersheds, stormwater runoff and water quality can be made, the connection between resident actions and the nutrient levels within their streams and lakes is much easier to grasp.

The inadequacy of residents understanding regarding nutrients and the impacts of their behaviors on water quality is a void that is finally receiving some much needed attention. The question that often arises is how nutrient education efforts can be constructed to best fill that gap in knowledge. The Center for Watershed Protection has found that decisions on developing effective nutrient education programs should be based on the answers to the following questions:

1. What is the individual **behavior** that is directly linked to **excess nutrient** pollution?

2. How **prevalent** is that behavior in the watershed population?

3. What is the specific **alternative** to the **behavior** that reduces nutrient levels?

4. What **outreach** methods get this message to the desired **population(s)**?

5. What **educational messages** are effective in changing the behavior?

6. How much **individual behavior change** can be expected in the **population**?

7. How much **nutrient** reduction will this translate to at the **watershed** level?

The answers to these questions provide a framework for creating or enhancing nutrient outreach programs. The answers may also determine what outreach techniques will be most effective at reaching the largest portion of a watershed population and altering their behaviors.

Executive Summary

As part of our survey, we asked Chesapeake Bay residents what outreach techniques they preferred for receiving nutrient messages. A comparison of their answers to the outreach techniques most often used by nutrient education programs revealed that the techniques residents considered the most effective where often not utilized by program managers. This was often due to funding or staff resource limitations for these nutrient education programs. Our survey found that most nutrient education programs were poorly funded ($2,000 - $25,000) and understaffed (.1 to .5 staff years).

A goal of our study was to determine the outreach techniques most effective at reaching the average watershed resident. According to the residents of our survey, media outreach in the form of television and newspapers is the most popular way of receiving nutrient management messages. At the same time, program managers are often still using the more traditional techniques of outreach such as training workshops and demonstration projects. To achieve significant changes in resident behavior, a modernization in the way that nutrient messages are relayed is necessary. This report provides recommendations on enhancing nutrient programs to achieve a broader appeal and ideas for ensuring that the most effective outreach techniques are used in communicating nutrient management messages.

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Preparation of this report would not have been possible without the valuable contributions of many experts from cooperative extension services, environmental organizations, and local, state, and federal government agencies. The Center for Watershed Protection would like to acknowledge the assistance of the following individuals who participated in our survey of nutrient education programs, and often supplied copies of their outreach materials.

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1.0 Introduction

Educational efforts to increase the awareness of Chesapeake Bay residents about their role in managing nutrients to protect water quality have been around for a number of years. Continued expansion of the suburban fringe has created a need for nutrient awareness and outreach programs that focus on more developed areas to educate urban and suburban residents on their contributions to nutrient loads. Structural best management practices, while very useful in protecting urban streams, have recently been shown to be relatively expensive in removing nutrients, in comparison with other nutrient reduction options, such as agricultural nonpoint source programs. Anecdotal evidence suggests that urban nutrient *prevention* programs could be a more cost-effective nutrient reduction strategy in developed and developing urban areas.

Several communities in the Chesapeake Bay and elsewhere have implemented nutrient education programs to protect water resources from excessive nutrient loading. In particular, many of the tributary strategies developed for the Chesapeake Bay emphasize some form of urban nutrient management education. However, these education programs are still in their infancy, and not much is known about their effectiveness in actually reducing nutrient loads.

To address these questions, the Center for Watershed Protection performed an initial assessment of nutrient education programs geared specifically toward lawns, septic systems and pet waste. This report summarizes the overall effectiveness of such programs, and examines what forms of outreach are preferred by residents and program managers. A set of recommendations for increasing the effectiveness of nutrient education efforts is then presented.

Information on the effectiveness of various nutrient reduction programs is indispensable to managers in the Chesapeake Bay in order to wisely allocate scarce resources. The ultimate effectiveness of any urban nutrient education program is dependent on three factors: (a) *how prevalent is the behavior* that education programs seek to modify (b) how effective is the education program in *getting its message out to* the population whose behavior needs to be influenced, and (c) what is the most effective educational technique to actually *change the behavior* in question.

In order to answer these questions, the Center for Watershed Protection developed two survey instruments to evaluate the effectiveness of current outreach programs. The two surveys were designed to measure the attitudes and behaviors that affect nutrient load levels, the forms of outreach preferred by both residents and program managers, and the costs associated with running an urban nutrient management program.

The *first survey* measured Chesapeake Bay area resident attitudes and practices concerning three nutrient producing behaviors; lawn care and fertilizer application, septic system maintenance and pet waste disposal. This market survey was conducted by the firm of Widener-Burrows & Associates, Inc and involved a telephone poll of Bay residents to derive a statistically valid sample of their current "nutrient loading behavior," as well as a determination of what nutrient outreach techniques they rated as effective in reaching and/or influencing them. The firm contacted a representative sample of

residents throughout the Chesapeake Bay region, who were asked to respond to a five minute survey regarding their experiences and behaviors. The survey was divided into four sections, including: (1) personal profile information (e.g., education, age, location) (2) lawn care practices (3) septic system maintenance and (4) pet waste management. Sections two through four included questions evaluating current behavior, awareness of various outreach efforts geared toward these nutrient behaviors, and whether residents had modified their behavior as a result of program efforts.

The *second survey*, conducted by staff at the Center for Watershed Protection, sampled fifty nutrient education programs from across the country that focused their outreach efforts on residents of more urbanized areas. Participants in the second survey included soil and water conservation districts, cooperative extensions, municipal stormwater National Pollutant Discharge Elimination System permitees, local Natural Resource Conservation Service offices, watershed organizations, regional non-government organizations and Environmental Protection Agency 319 grantees. Key topics in the program survey included: annual budget and staffing, media and outreach techniques employed, estimates of penetration and/or participation rates, innovative programs, and an open-ended response on the overall adequacy of their urban nutrient education program.

The third element of the project was a detailed assessment of 15 other market and public attitude surveys concerned with nutrients or nonpoint source pollution that have been conducted elsewhere in the country. These surveys provide a broader profile of watershed nutrient behaviors, and shed light on techniques to improve the effectiveness of nutrient education programs.

2.0 Methodology

A. Resident Survey Methodology

For the resident survey portion of the project, an eight page questionnaire was created to gauge resident attitudes and behaviors with regards to lawn care, septic system maintenance, and pet waste disposal. The questionnaire was designed to be taken by telephone, and was therefore purposely limited to a length of five to seven minutes in order to increase the likelihood of participation. The final survey instrument consisted of thirty-five questions, including sections on outreach effectiveness and respondent demographics. See Appendix A for a copy of the resident survey instrument.

Telephone interviews were conducted among a stratified random sample of 733 adult heads of household in the Maryland, Pennsylvania and Virginia regions of the Chesapeake Bay watershed. The number of surveys completed was divided approximately evenly across the three states, and within each state among those living in "rural/septic" areas or "urban/suburban" areas. The "rural/septic" areas were defined by specific zip codes that were considered to be more rural in nature and have a higher likelihood of having septic systems. The "urban/suburban" areas were selected based on population size and proximity to waterways that feed into the Chesapeake Bay . (See Figure 1 for maps of the specific areas included in this survey).

Survey responses were evenly distributed between men and women. The geographic areas included in the study and the total number of completed interviews for each state are provided in Table 1.

Table 1.
Geographic Distribution of
Phone Survey Respondents

State	Number of Completed Interviews
Maryland	242
Pennsylvania	245
Virginia	246

Respondents were selected using a random list of phone numbers generated by Sophisticated Data Research, Inc. Interviews were conducted between January 20, 1999 and February 3, 1999 during evening and weekend hours. All interviewing was conducted by experienced telephone interviewers supervised by professional WB & A Market Research staff.

The total sample size of 733 will yield data that has a statistical reliability of $\pm$ 3.6 percentage points at the 95% confidence level. This means that we could expect that 95 out of 100 times the percentage of a respondents who would give a similar answer to a given survey question would be within $\pm$ 3.6 percentage points of our survey results.

Demographics

The demographics of the Center for Watershed Protection (hereafter referred to as CWP) survey were compared to a related attitude survey conducted for the Chesapeake Bay Program in 1994 . In general, the demographics of our survey closely matched that of the Bay Program attitude survey (Table 2). With respect to age profiles, the Center survey generally mirrored the Bay Program, with the exception of the youngest age group (18-24). Income and gender were also closely correlated. There was some difference in education level, with more participants in the CWP survey having college or post- college advanced degrees. There were also some significant differences in the race categories. In the Center's survey, 90% of the participants were White and 7% were African American, while in the Bay Program's survey 77.2% and 18% of participants appeared in the White and African American categories, respectively. The demographics are illustrated in the table below.

Table 2.
Comparison of Demographics for CWP and Chesapeake Bay Program Surveys

Center for Watershed Protection Survey Demographics

Age Categories	
18-24	5%
25-34	16%
35-44	25%
45-54	23%
55-64	12%
65+	19%

Income Categories	
Under $15,000	8%
$15,000 - $25,000	9%
$25,001 - $35,000	17%
$35,001 - $50,000	18%
$50,001 - $75,000	24%
$75,001 - $100,000	13%
$100,000 +	12%

Chesapeake Bay Program Survey Demographics

Age Categories	
18-24	11%
25-34	21%
35-44	23%
45-54	19%
55-64	12%
65+	14%

Income Categories	
$12,000 or Less	4.4%
$12,000 - $20,000	9.7%
$20,000 - $30,000	16.5%
$30,000 - $50,000	29.4%
$50,000 - $75,000	18.9%
$75,000 - $100,000	13.4%

Table 2 Continued
Comparison of Demographics for CWP and Chesapeake Bay Program Surveys

Center for Watershed Protection Survey Demographics

Education Categories	
Less Than High School	9.2%
High School Graduate	29.8%
Vocational/Technical	3.9%
Some College	20.5%
College Graduate	22.9%
Advanced Degree	13.7%

Race Categories	
White	90%
Black/African-American	7%
Hispanic	1%
Other	2%
Asian	1%
Native American	1%

Gender	
Male	50%
Female	50%

Chesapeake Bay Program Survey Demographics

Education Categories	
Less Than High School	23.2%
High School Graduate	30.4%
Some College	24.2%
College Graduate	13.8%
Post Graduate	8.3%

Race Categories	
White	77.2%
Black/African-American	18%
Hispanic	1.2%
Other	2%
Asian	1.5%

Gender	
Male	48%
Female	52%

B. Program Manager Survey Methodology

An initial list for the survey of nutrient education program managers was generated through a two step process. First, an Internet search was conducted to pinpoint nutrient education programs that included urban and suburban residents as part of their target audience. Second, Center staff identified program managers that they had encountered who were involved in nutrient education programs, specifically for more urbanized areas. These two sources were then used to generate a list of contacts who it was hoped might be able to supply additional sources.

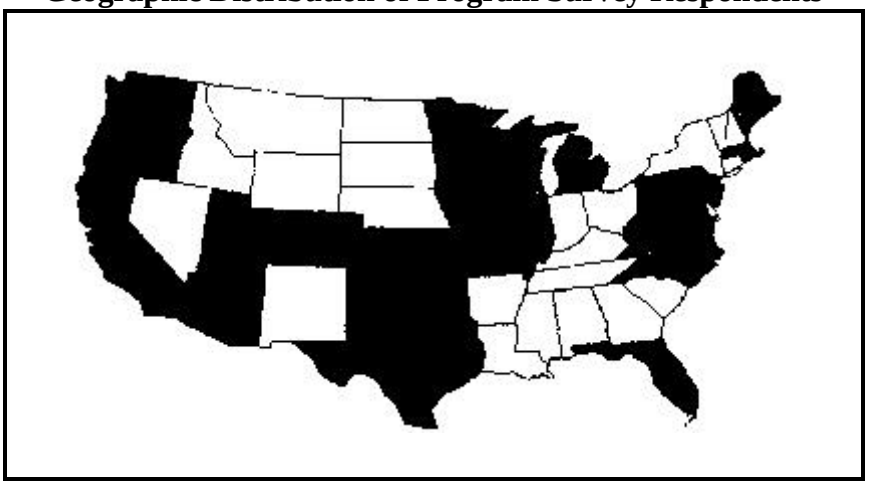
Each program manager was contacted by Center staff through phone or in person interview. Respondents were asked to describe their programs and educational efforts, and whether they knew of additional agencies that were also involved in nutrient education outreach efforts. The program managers were then asked to participate in a mail-in survey in order to provide more detail as to the characteristics of their education efforts.

A six page survey instrument was then produced and was composed of three sections on lawn care, septic system, and pet waste education programs. Survey respondents were asked a number of open ended questions regarding their programs, including if they had performed any evaluations of their own programs in terms of effectiveness at reaching residents. See Appendix B for a copy of the program survey instrument.

Phone interviews were conducted with numerous programs from across the country, and 75 were selected to receive mail-out surveys. These surveys were sent between January 25, 1999 and March 2, 1999. Please see the acknowledgment section for a list of the 50 programs that responded to the mail-out survey. Figure 2 shows the geographic distribution of the 50 programs.

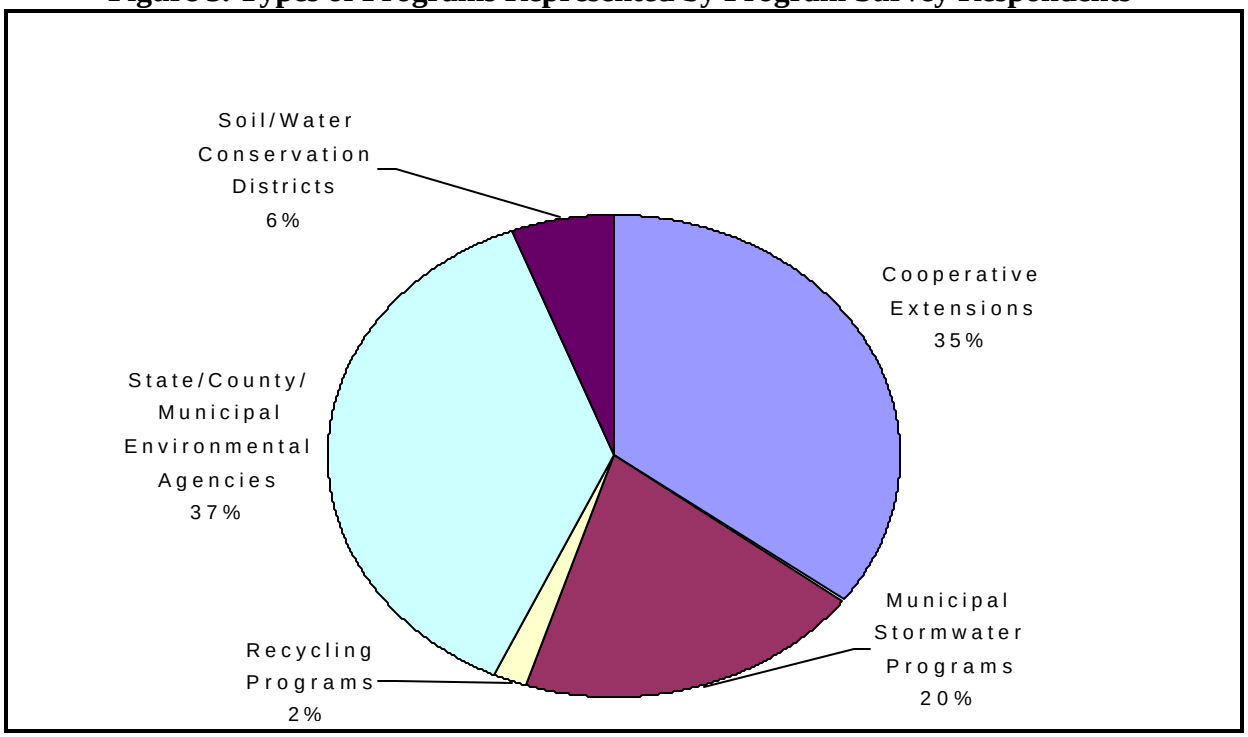
The results of these surveys were then examined to generate information on outreach techniques currently being used by nutrient education programs, as well as innovative ideas for more effective outreach. Program managers were also asked to use their own experiences to gauge a variety of outreach techniques as to their effectiveness in attracting the public.

Figure 2.
Geographic Distribution of Program Survey Respondents



Participants in the nutrient education program survey were primarily drawn from the following five types of organizations: cooperative extension services; municipal stormwater management programs; recycling programs; state, county, and municipal environmental agencies; and soil and water conservation districts. The chart below illustrates the percentage of respondents from each of the five categories (Figure 3).

Figure 3. Types of Programs Represented by Program Survey Respondents



The total number of program survey participants was fifty. The program survey covered key topics such as annual budget and staff time; program age, effectiveness of outreach techniques; innovative programs; and outreach techniques used (e.g., TV, video, one-on-one consultations, Internet website, demonstrations, radio, and workshops). It is important to note that not all program managers completed all three sections of the survey. However, some of the programs had a general nonpoint source pollution education element that addressed all three issues. Table 2 illustrates the number of participants who had completed each section.

Table 3
Nutrient Education Program Survey Completion Rates

Completed	Number
All 3 Sections	10
Lawn Care and Septic System Sections Only	12
Lawn Care and Pet Waste Sections Only	4
Lawn Care Section Only	19
Septic System Section Only	3
Pet Waste Section Only	2
Total	50

C. Survey Caveats

There are a number of differences in the sampling plan we used for our citizen survey that make our final results unique when compared to previous nutrient surveys. The caveats that should be noted regarding our survey are reviewed in the following paragraphs.

The first caveat is that this survey was much broader in scope than most prior surveys regarding nutrient behavior. Our phone survey actually covered a three state area (Maryland, Pennsylvania, and Virginia) rather than the smaller survey units that are typically based on smaller sampling areas, such as county, subwatershed or even a single neighborhood unit.

Second, our survey solicited information on lawn care practices over a wide range of lawn sizes, since we sampled individuals in both rural and suburban areas. This may have caused our results to be different from previous lawn care studies, although, as it turned out, there was little statistical difference in lawn care practices among suburban and rural property owners. Our broader survey should more accurately reflect the impacts from nutrient management practices at the watershed scale, due to the variety in lawn sizes sampled.

Our survey purposely excluded large highly urban areas from the sampling plan. This was due to the unique characteristics of urban cities, which include a lack of septic systems, smaller yard sizes or absence of yards and higher levels of imperviousness that increase stormwater runoff. Prior studies also have shown that fertilization rates are much lower in ultra-urban areas (13).

A final caveat concerns any survey that attempts to question a person about their behaviors or attitudes. The accuracy of an answer is a direct reflection of the social acceptance of any behavior. When people are reporting on their own actions, they often feel the need to give the most socially acceptable or expected response. Thus, while we attempted to word the questions to elicit the most honest and true response, the possibility exists that some respondents may have overstated their likelihood or frequency of doing an act.

Figure 1. Geographic Distribution of Resident Survey Respondents

3.0 Results of Resident Survey

The goal of the resident phone survey was to provide insight into the awareness and behavior of Chesapeake Bay residents in regards to nutrient management. The survey also sought residents' opinions on the most effective outreach techniques for distributing nutrient management information to the general public. An understanding of the motivations behind resident behaviors and what attracts the attention of the average resident is necessary in order to create the most effective nutrient education program. The following are the key results of the survey. To review the entire survey and results, see Appendix C.

A. Lawn Care Practices

The first section of the survey questioned residents on their behaviors with regards to basic lawn care practices. The section began with some general lawn care questions regarding lawn maintenance practices for all Bay residents.

Q1. Do you have a lawn or yard? Total Number of Respondents = 733	
Yes	89%
No	11%

Eighty-nine percent of the respondents indicated that they had a lawn or yard. Of those people that did have lawns, the overwhelming majority (91%) maintained their own lawns or yards.

Q2. Who maintains your lawn?	
Self/Other member of household	91%
Lawn Care Company	7%
Landlord/Complex Management	2%
Friend/Neighbor	1%
Someone else	4%

Only 45 residents (about 7%) used a lawn care company to maintain their yard: of those forty-five, only one indicated that being environmentally friendly was the deciding factor in selecting their lawn care company.

Q3. How did you choose your lawn care company?	
Contacted directly by company	24%
Recommendation of Friend/Relative	18%
Reputation for high quality lawns	16%
Cheapest rates	4%
Being environmentally friendly	2%

Lawn Care Advice

The next series of questions dealt with the attitudes of residents who maintained their own lawns as to whether they sought advice on managing their lawns. Sixty-four percent of respondents indicated that they had not obtained advice or information on lawn management issues such as watering, fertilizing, composting, or establishing turf.

Q4. Have you ever obtained advice/information on how to manage your lawn, such as watering, fertilizing, composting, or establishing turf?	
Yes	35%
No	64%

Of those who had sought lawn care advice, 57% indicated that they received information or techniques on managing their lawns to better protect the environment.

Q5. Did this advice include information or techniques on managing your lawn to better protect the environment?	
Yes	57%
No/Don't Know	43%

However, as a result of this advice, only 13% of the respondents indicated that they had made significant changes to the way that they cared for their lawn (Figure 4).

Q6. As a result of receiving this information, did you make changes in the way you care for your lawn?	
Significant Changes	13%
Some Changes	48%
No Changes	36%
Don't Know/Refused	3%

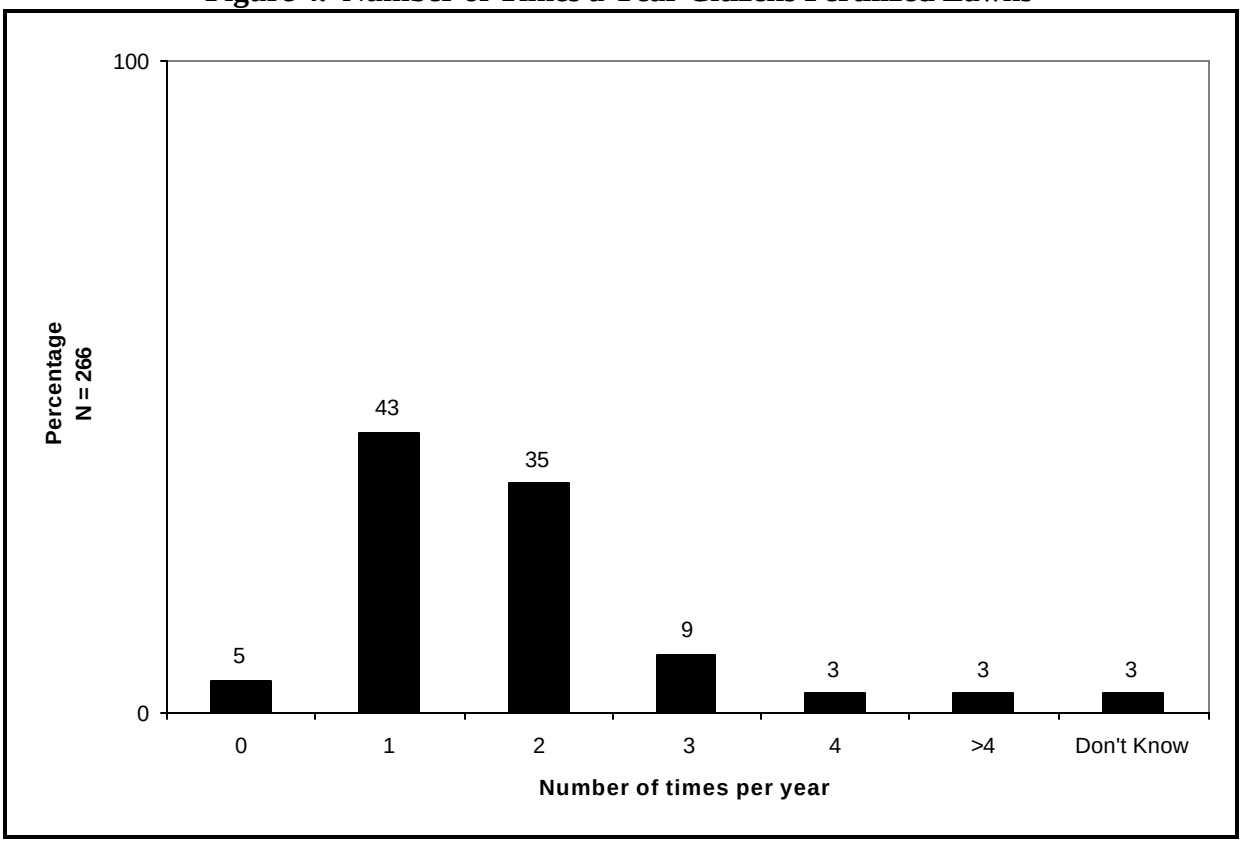
The level of education of the respondents was a determining factor in whether they sought advice on maintaining their lawn and whether they implemented this advice. Those respondents with higher levels of education (college+) and higher incomes (> 50K) were more likely to seek advice and to use that advice to make at least some changes in their lawn care practices.

Fertilization Practices

The next series of questions had to do with Bay resident practices regarding fertilization of their yards. Of people who had lawns or yards, more people (50%) indicated that they did not fertilize their yards. Survey respondents with higher levels of education (college+) and incomes (> 50K) were more likely to use fertilizers.

Q7. Do you fertilize your yard?	
Yes	50
No/Don't Know	50

Figure 4. Number of Times a Year Citizens Fertilized Lawns



Of the people who did fertilize, 48% fertilized once a year or less and 83% fertilized twice a year or less (Figure 4). Income, education and age were all determining factors, with older, higher income households more likely to fertilize more than once a year.

Spring was the overwhelming choice for fertilizing their lawns (73%), with Fall the next most popular application time (Figure 5).

Figure 5. Seasons When Lawns are Fertilized

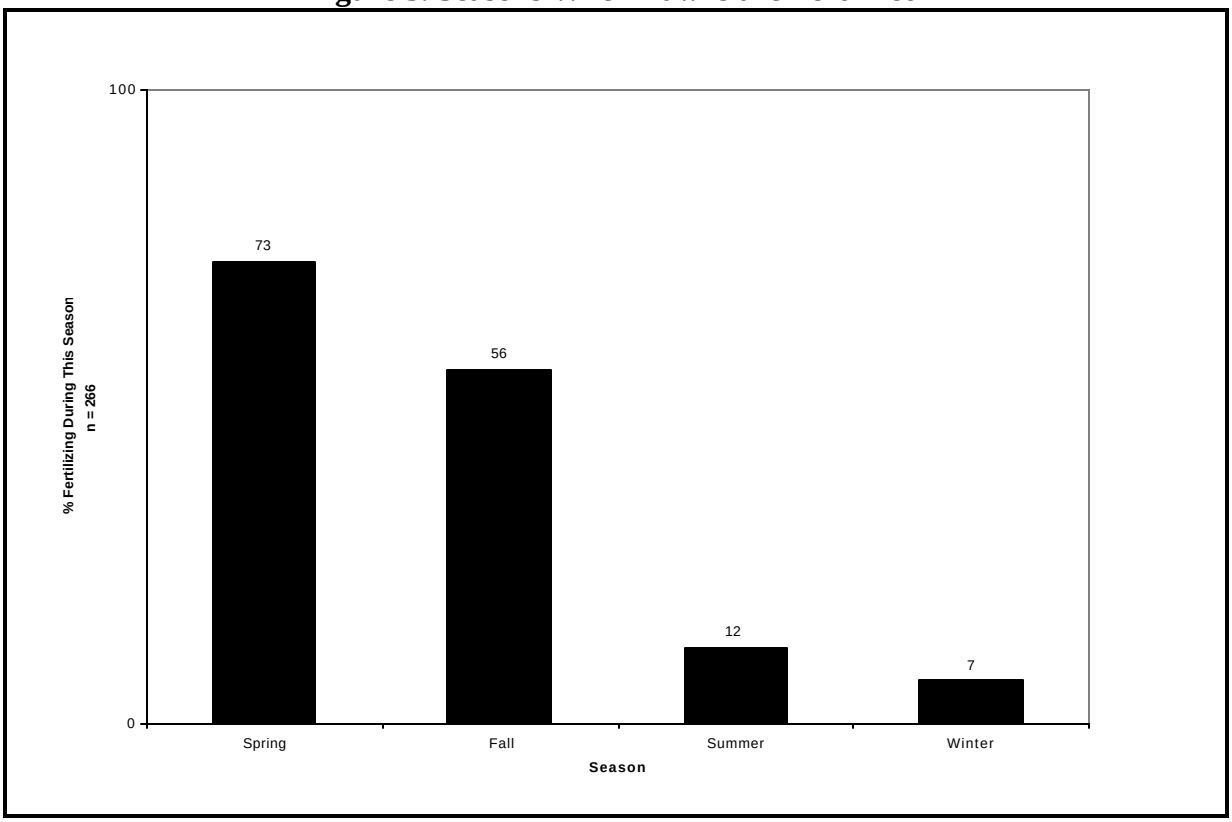
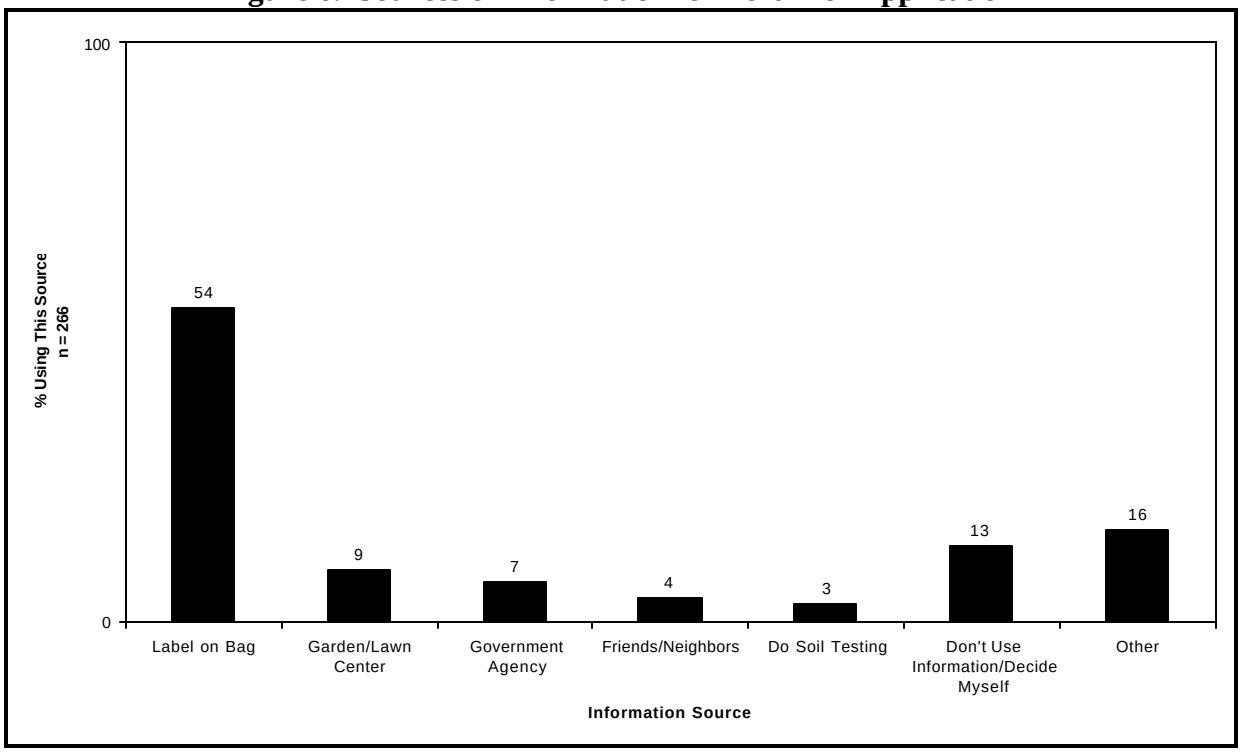


Figure 6. Sources of Information for Fertilizer Application



The majority (54%) of the respondents who did fertilize indicated they consulted the label on their bag of fertilizer to determine the proper application level for their lawn (Figure 7). The next most popular choice was not to use any information or to decide for themselves how much was needed.

Despite its value in determining the appropriate the amount of fertilizer needed, 84% of respondents had not received or performed a soil nutrient test on their lawns in the last three years.

Q11. Have you had a soil nutrient test in the last three years?	
Yes	16%
No/Don't Know	84%

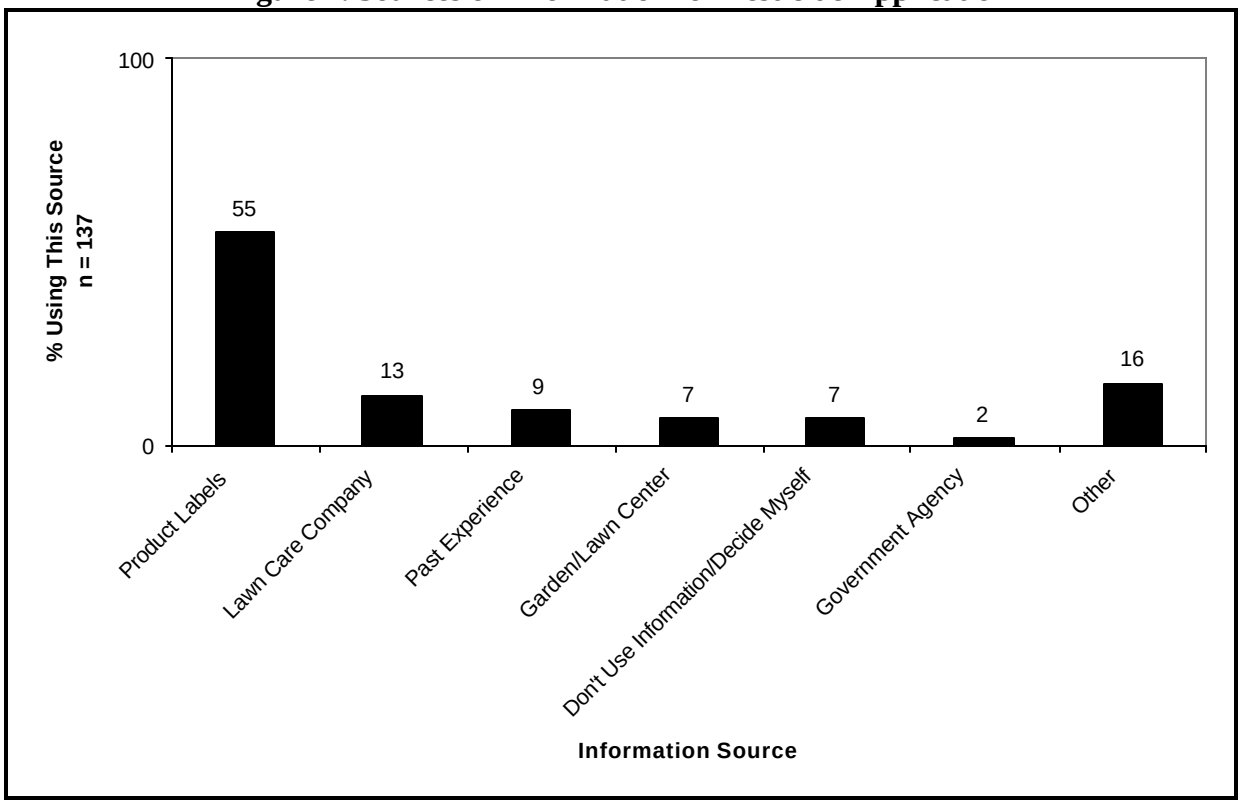
Pesticide Use Practices

When asked about their pesticide use in the last year, 79% of surveyed residents reported that they had not applied pesticides to their lawn or garden.

Q13. Have you applied pesticides to your garden or yard in the last year?	
Yes	21%
No/Don't Know	79%

Of the households that used pesticides, 55% indicated they used product labels to select pesticide application information (Figure 8). This was especially true for men (61%) as compared to women

Figure 7. Sources of Information for Pesticide Application



(44%). This use of product labels as the primary source of application information is similar to the results for fertilizer application information.

Comparison to previous survey results

A comparison of nine lawn care surveys from several regions of the country indicates that our results were reasonably similar to other lawn care studies, with the exception of a number at the low end of the range for the percent of lawns being fertilized. Table 4 summarizes the comparison of the nine surveys.

Table 4. Lawn Care Practices: A Comparison of Nine Homeowner Surveys

Study **	Respondents	% of Lawns Fertilized	% of Soil Tests	Other Notes
Maryland (18)	403	87%	NA	
Virginia (3)	100	79%	> 20%	
Minnesota (14)	981	75%	12%	Average # of times fertilized 2.1 times/year 40% left clipping
Maryland (9)	100	88%	15%	58% left clipping
Minnesota (6)	136	85%	18%	78% left clipping
Wisconsin (12)	204	54%	NA	Average # of times fertilized 2.4 times/year
Baltimore (13)	164	73%	NA	Average # of times fertilized 2.1 times/year
Florida (11)	659	82%	NA	Average # of times fertilized 3.2 times/year 59% left clipping
This Survey	656	50% *	16%	Average # of times fertilized 1.73 times/year

* This includes those who maintained their own yards, those who used a lawncare company, those who had their yard maintained by a landlord or complex management, and those who reported themselves as "don't know."

** The number in parentheses after each study refers to a corresponding number in the references cited section of this report.

The comparison did reveal some variability between the percentage of residents reporting a lawn care behavior, especially regarding the use of fertilizer. Our survey had the lowest number of residents reporting fertilizer use of the nine surveys. There are a number of reasons that might explain this difference. One reason may be the broader scope of our survey when compared to the other surveys. The CWP survey covers both rural and suburban areas and therefore includes a range of lawn sizes that may influence the likelihood of fertilizer use. Other factors that may also explain this difference include the age and income of the residents surveyed (the other surveys may have sampled more residents between the ages of 45 - 54 with higher incomes who have been found to be more likely to fertilize), and whether those surveyed were already participants in a lawn care class or were actively seeking lawn care or fertilizer application information.

The percentage of those residents receiving or performing soil nutrient tests on their lawn tended to fall within a range of 12-28%. Our results fell within this range, with 16% of residents indicating they had used a soil nutrient test. Soil nutrient testing is recommended to determine the level of nutrients naturally present in the soil. This information is then used to calibrate exactly how much fertilizer is needed for an individual yard. The benefit of this is that the use of excessive amounts of fertilizer is avoided, thereby reducing nutrient runoff from residential neighborhoods.

Several surveys provide us with information on the frequency of fertilization. While the CWP survey found that the average number of times per year that Bay residents applied fertilizer was 1.73, surveys in other areas found much higher application rates (1.9-3.2 times/year). This exceeded the usual fertilizer application rate of once a year recommended by most lawn care education programs. The timing of fertilizer application often departed from recommended practice, as well. The recommended application time is generally in the fall season. Our survey indicated that Bay residents actually preferred to apply fertilizer in the spring, with fall application being the second most popular time.

B. Septic System Maintenance

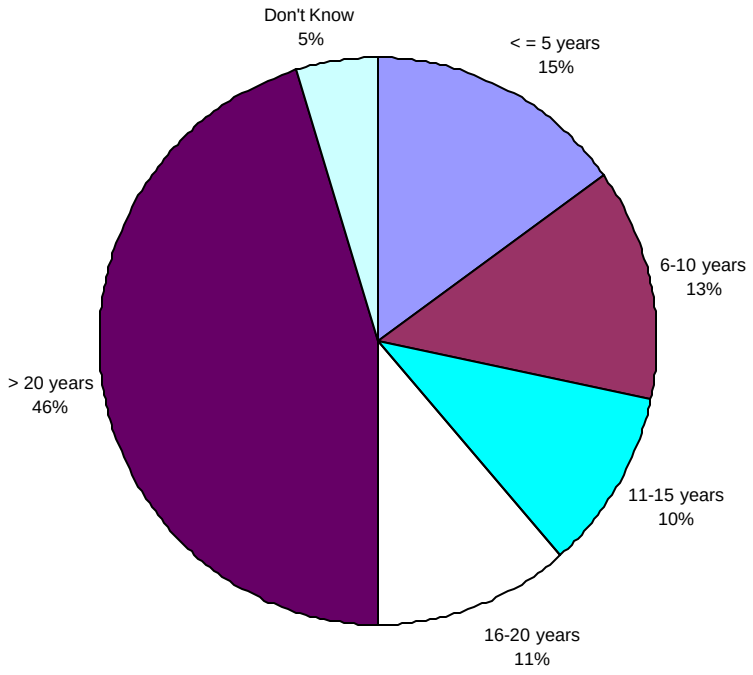
The next section of the survey quizzed septic system owners on their knowledge about their septic system and its maintenance. The key findings were as follows:

Approximately half the households surveyed (n = 363)indicated that they were served by an on-site disposal system (septic system).

Q 15. Is your home served by a septic system?	
Yes	50%
No/Don't Know	50%

Forty-six percent of the homes served by septic were more than twenty years old, with 26% of the homes over thirty years old. Overall, the mean age of septic systems in our survey was 27 (Figure 8). This is significant, since the average design life of a septic system is 20 years, depending on climate and soil conditions.

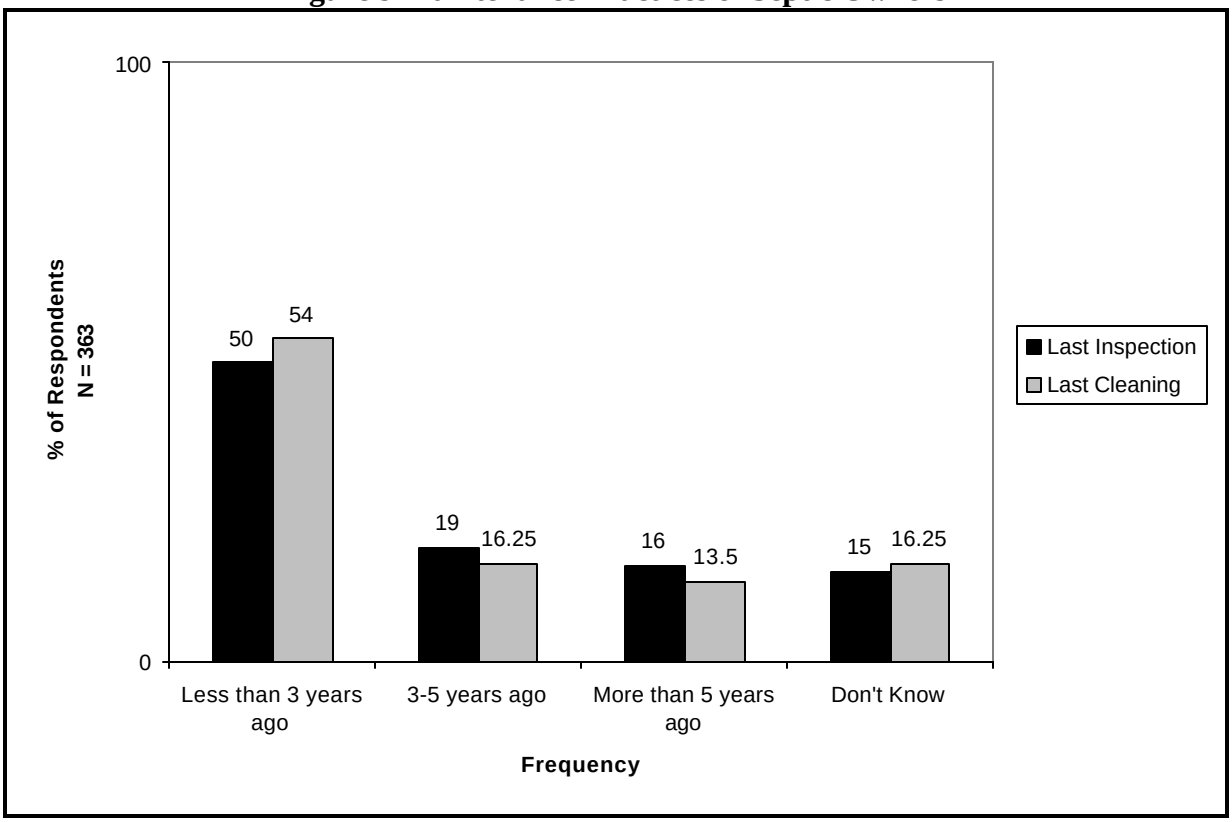
Figure 8. Age of Septic Systems in Resident Survey



Most residents (88%) indicated they knew approximately where their system was located in their yard,

with those over the age of 45 more likely to know than those under that age.
The next series of questions dealt with standard care practices that are recommended for the proper functioning of septic systems (Figure 9). Fifty percent of those surveyed that used on site disposal systems had not had their systems inspected in the last three years and 46% had not had the system

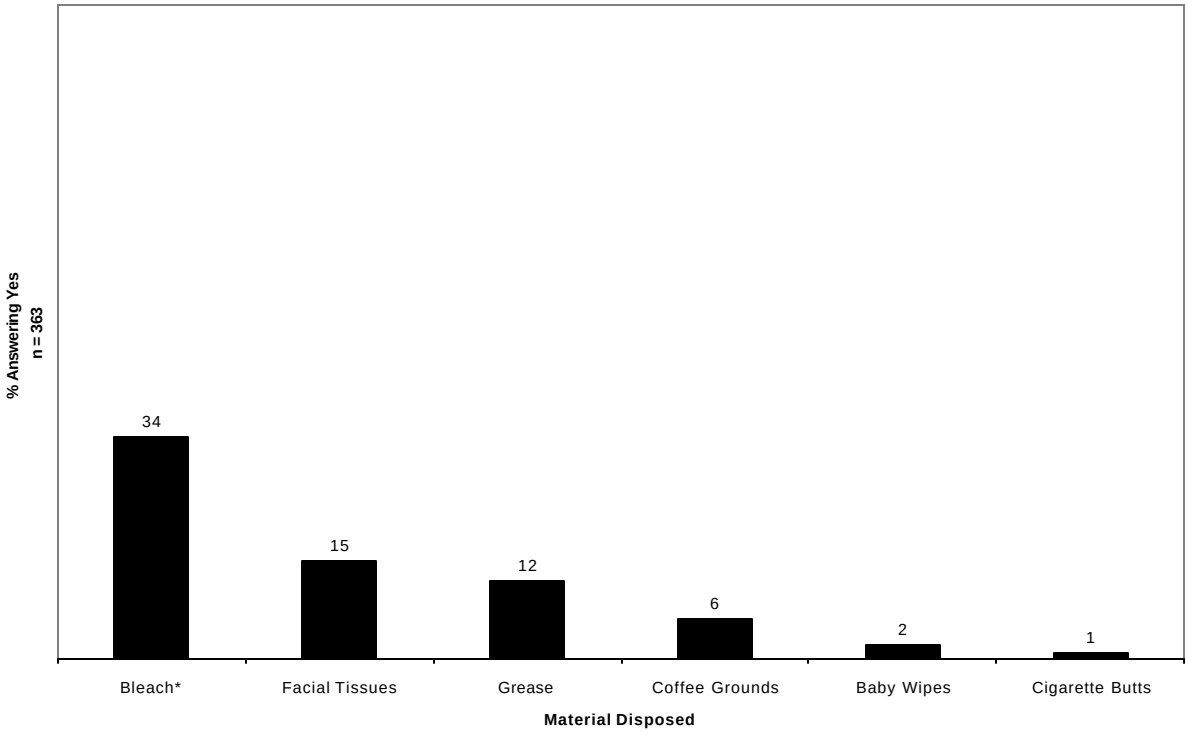
Figure 9 Maintenance Practices of Septic Owners



cleaned in the last three years.
The next question was designed to test resident knowledge about what materials are acceptable to dispose into the septic system. The list of materials was generated from several publications on septic system maintenance, and included one material (bleach) that is acceptable for disposal in limited amounts. The results indicate that most residents seemed knowledgeable as to what was acceptable, with low percentages for those materials that are considered undesirable (e.g., coffee grounds, grease, facial tissues.) (Figure 10)

When it came to seeking advice on maintaining their septic systems, only 43% of septic owners utilized outside sources for information (Figure 11). For those people who did seek advice, professional septic service companies were the primary source of information (57%). Age and income were factors in seeking advice, with those over 45 and those with higher incomes more likely to solicit advice.

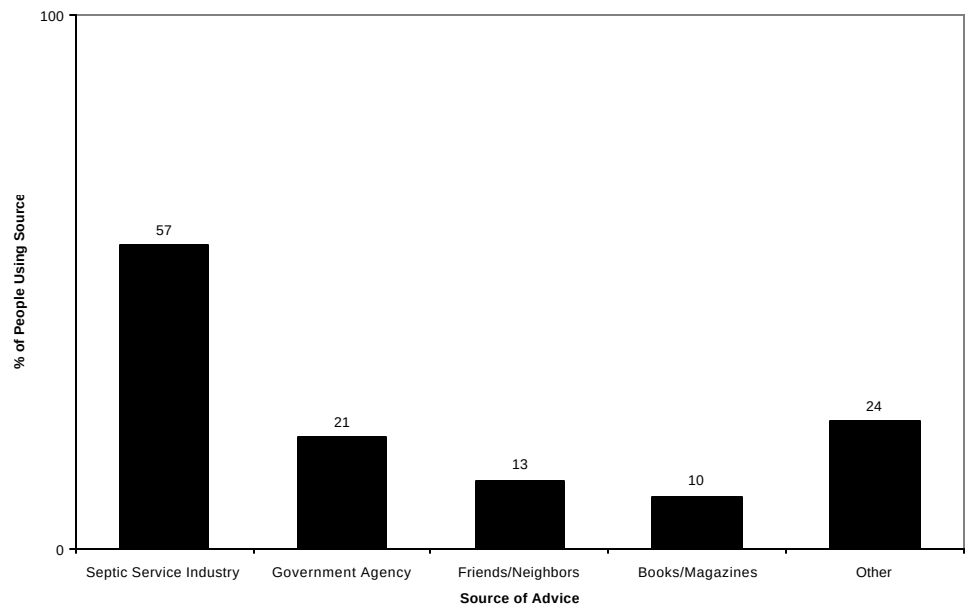
Figure 10. Materials Disposed in Household Septic Systems



When questioned about their awareness about septic system maintenance and water quality, 30% of all septic owners either disagreed or expressed no knowledge with regards to the statement "Routine inspection and clean out of septic tanks is necessary to protect the water quality of the bay." Men were more likely to disagree and to disagree strongly with this statement than women.

Q23. Rate agreement with this statement: "Inspection and Routine Clean Out of Septic Tanks is Necessary to Protect the Water Quality of the Bay."	
Agree strongly	46%
Agree somewhat	24%
Disagree somewhat	10%
Disagree strongly	8%
Don't Know	12%

Figure 11. Sources of Advice for Septic Maintenance



The phone survey responses support that there is a general lack of understanding of the maintenance

required to ensure a proper functioning septic system. Most septic outreach materials recommend an annual inspection of the system to minimize maintenance costs and extend the life of the system. Our survey found that 50% of septic owners had not followed this advice.

Cleaning out of the septic system through regular pumping is also an important practice in maintaining a septic system. Even so, 46% of septic owners had not performed this action in the past three years. Many septic care professionals recommend as a general rule of thumb that systems should be pumped about every three years, with required pumping frequencies determined by the size of the tank and the number of people in the household. If a garbage disposal is installed in the household, pumpout may be required more often.

Our survey shows that the relationship between a properly maintained septic system and the water quality of the Chesapeake Bay is not fully understood by a significant fraction of Bay residents. The low number of septic owners seeking advice on septic maintenance indicates a lack of knowledge regarding the link between water quality and septic failure. The absence of interest in septic system impacts may be due to the impression that maintenance procedures for septic systems are too expensive or are not required on a regular basis for the proper functioning of a system. Homeowners need to be reminded that the cost of regular inspection and pumpouts every three years ($100 - $250) is far cheaper than the estimated $2,000 to $8,000 it may cost to replace a malfunctioning system. Even those with relatively new homes need to be informed that the relative age of a system does not guarantee its proper function, and that an improperly installed system can fail within three to five years even for a new housing site.

C. Dog Waste Disposal

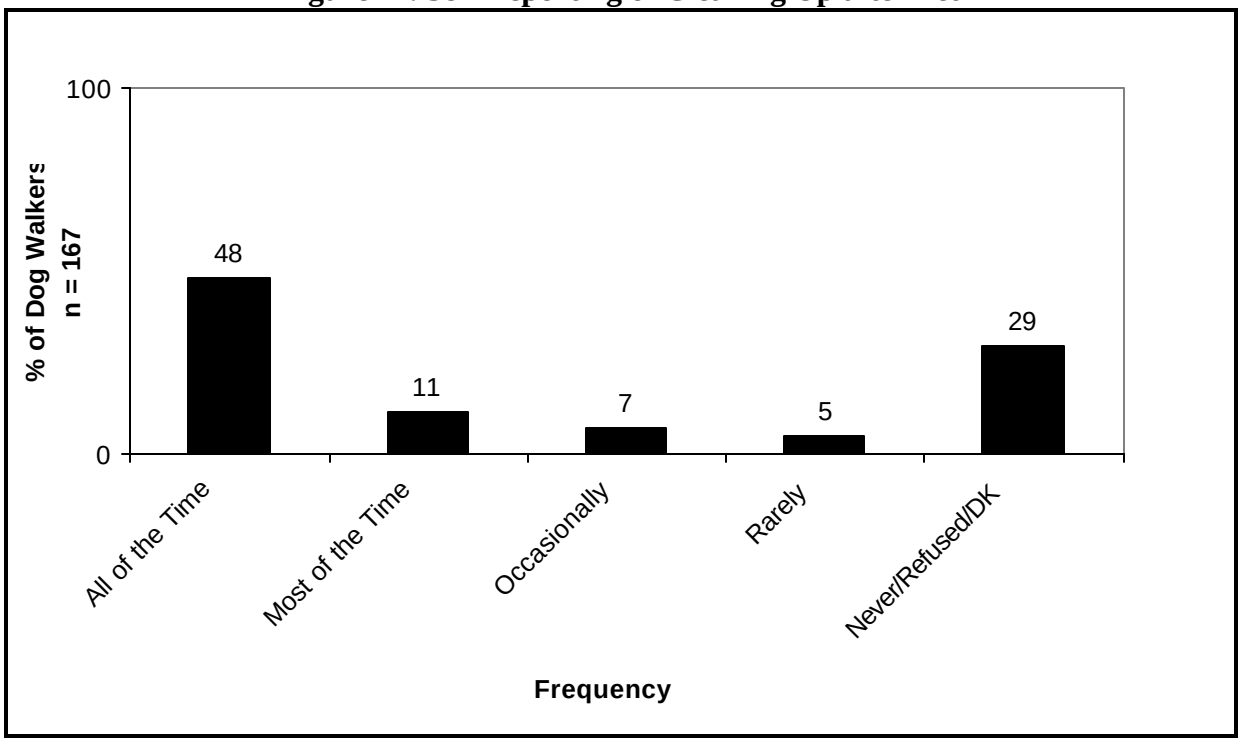
The third section of the survey asked those residents who had dogs about their attitudes and practices regarding the disposal of pet waste. Forty-one percent of Bay residents indicated that they owned a dog, and of those dog owners, 56% (167 residents) personally walked their own dog.

Q24. Do you own a dog?	
Yes	41%
No	59%

Q25. Do you personally walk your dog?	
Yes	56%
No	44%

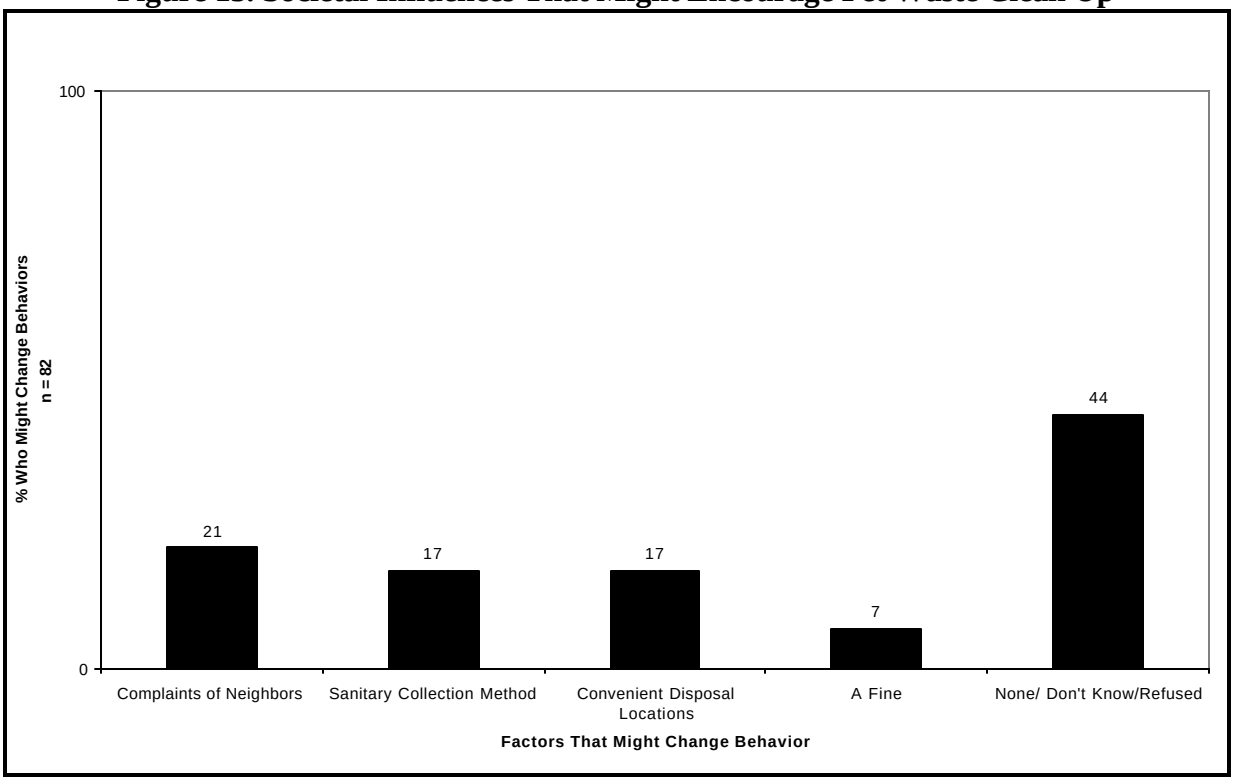
When questioned on their disposal practices for dog waste, 34% of the people who walked their own dogs said that they rarely or never picked up after their dogs or refused to answer the question (Figure 12).

Figure 12. Self Reporting of Cleaning Up after Pet



Those residents that didn't always clean up after their dog were then given a list of methods commonly used to encourage the clean up of dog waste, and asked which methods might alter their behavior (Figure 13). Forty-four percent of these "bad actors" indicated that none of the proposed methods would change their behavior.

Figure 13. Societal Influences That Might Encourage Pet Waste Clean Up



The last question in the survey asked those who walked their dogs about their attitudes toward pet waste and its influence on nearby streams. Sixty-three percent of all dog owners who personally walked their dogs agreed with the statement "Pet waste can be a source of nutrients and bacteria for nearby streams and water bodies."

Dog waste is an issue that does not receive a lot of attention, except when you have some on your shoe. Therefore, there have not been a large number of surveys done on resident attitudes and behaviors toward dog waste. A comparison of two surveys we were able to find shows that while the number of dog walkers who claim to pick up after their dog is fairly consistent, the rate of clean up varies widely. In one survey, some owners who claimed to always clean up after their dog then stated that they performed this task anywhere from twice a week to once a month. Table 5 summarizes the results of those surveys.

Table 5.
Pet Waste Disposal Behaviors from Three Surveys

Maryland (9)	62% always cleaned up after the dog, sometimes 23% never 15%. Disposal method: trash can (66%), toilet (12%), other 22%
Washington (8)	69% claimed that they cleaned up after the dog, 31% do not pick up. Disposal methods: trash can 54%, toilet 20%, compost pile 4% 4% train pet to poop in own yard 85% agreed that pet wastes contribute to water quality problems 51% of dog owners do not walk dogs. Pet ownership 58%
Chesapeake Bay (This Survey)	Dog ownership 41% 44% of dog owners do not walk dogs Dog walkers who clean up most/all of the time 59% Dog walkers who never or rarely cleanup 41% Of these, 44% would not cleanup even with fine, complaints, collection or disposal methods 63% agreed that pet wastes contribute to water quality problems

The reasons given for picking up or not picking up after their dog were quite varied. Table 6 lists some of the reasons given in the Maryland survey (9).

Table 6
Dog Owners Rationale for Picking Up or Not Picking Up After Their Dog

Reasons for not picking it up:	**Reasons for picking up:**
because it eventually goes away	It's the law 18%
just because/no reason	Environmental reasons 42%
too much work	Other 40%
on edge of my property	hygiene/health reasons
it's in my yard/its in the woods	courtesy
not prepared	non-flushable
small dog, small waste	it should be done
use as fertilizer	keep the yard clean
sanitary reasons	

The biggest problem with the issue of pet waste is that many residents do not perceive it as a water quality issue. In our survey, 37% of dog walkers did not agree or expressed no knowledge when asked if pet waste could contribute nutrients to local water bodies. And when 600 King County, Washington residents were asked their perceptions on important factors that cause water pollution, pet waste ranked last as a contributor to water pollution (20). Table 7 shows the factors residents named and their rating. Obviously, a stronger connection between pet waste and water quality needs to be established before nutrient education efforts can hope to change deeply rooted behaviors like refusing to clean up after one's dog.

Table 7
Resident Assessment of Contributing factors to Local Water Pollution
(Source: 30)

Contributing Factor	Rating (1 to 5)	Contributing Factor	Rating (1 to 5)
Industrial Waste	4.28	Agriculture	2.87
Changing Oil	3.36	Driving a Car	2.85
Pesticides	3.34	Fertilizing Lawn	2.83
Boating	3.15	Livestock	2.53
Logging	3.07	Washing Car	2.30
Shoreline	3.07	Pet wastes	2.08

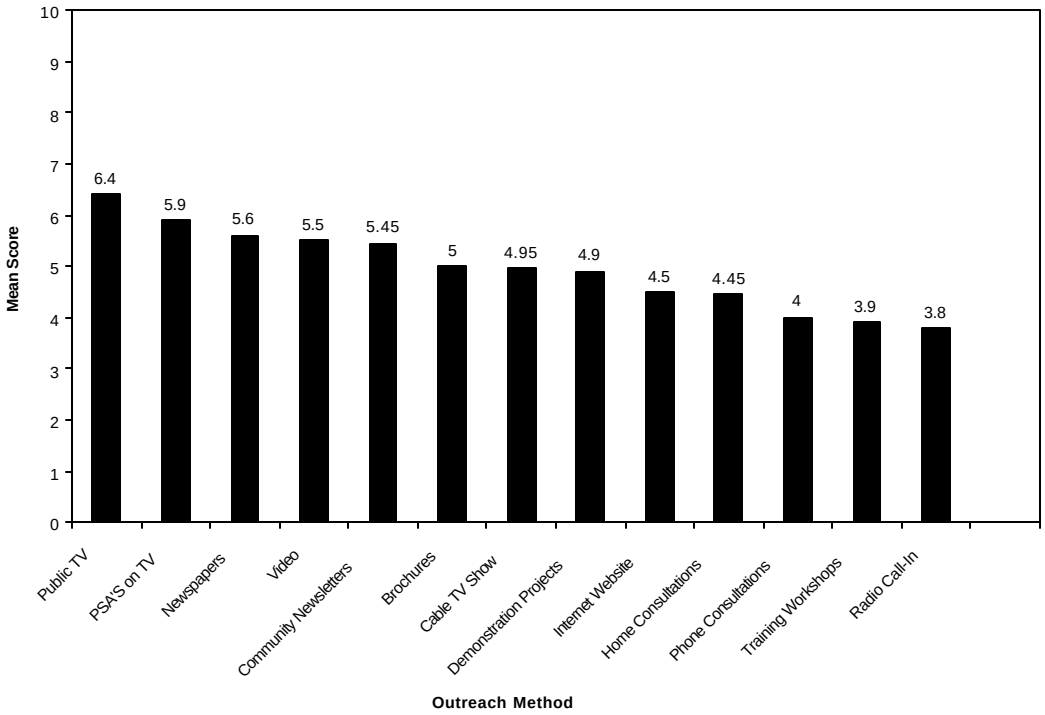
D. Resident Rating of Outreach Techniques

A major goal of our survey was to determine what was being done to educate residents on nutrient management practices, and whether or not residents were hearing or seeing the messages. To accomplish this goal, we asked residents how they felt about the current outreach techniques and whether there were more effective techniques they might prefer.

We asked residents to evaluate fourteen different outreach techniques that have been used to inform residents of the impacts of nutrients on their local water quality. These techniques have been used by programs from around the country, and were selected at random as representative of outreach practices. This list is by no means exhaustive, but was designed to elicit the feelings of Bay residents on what outreach techniques were most successful at attracting their attention. Figure 14 provides a graphical illustration of citizen preferences.

As we can see from Figure 14, television was the preferred medium for receiving information on protecting water quality for Bay area residents. Spots on public televisions shows on home or lawn care subjects were the most popular way that Bay residents felt they could be effectively reached. Of the fourteen techniques that residents could choose from, television related outreach occupied three of the top seven spots. Newspaper columns or advertisements were also effective, as were community or city newsletters.

Figure 14. Citizen Ratings of the Effectiveness of Various Outreach Techniques

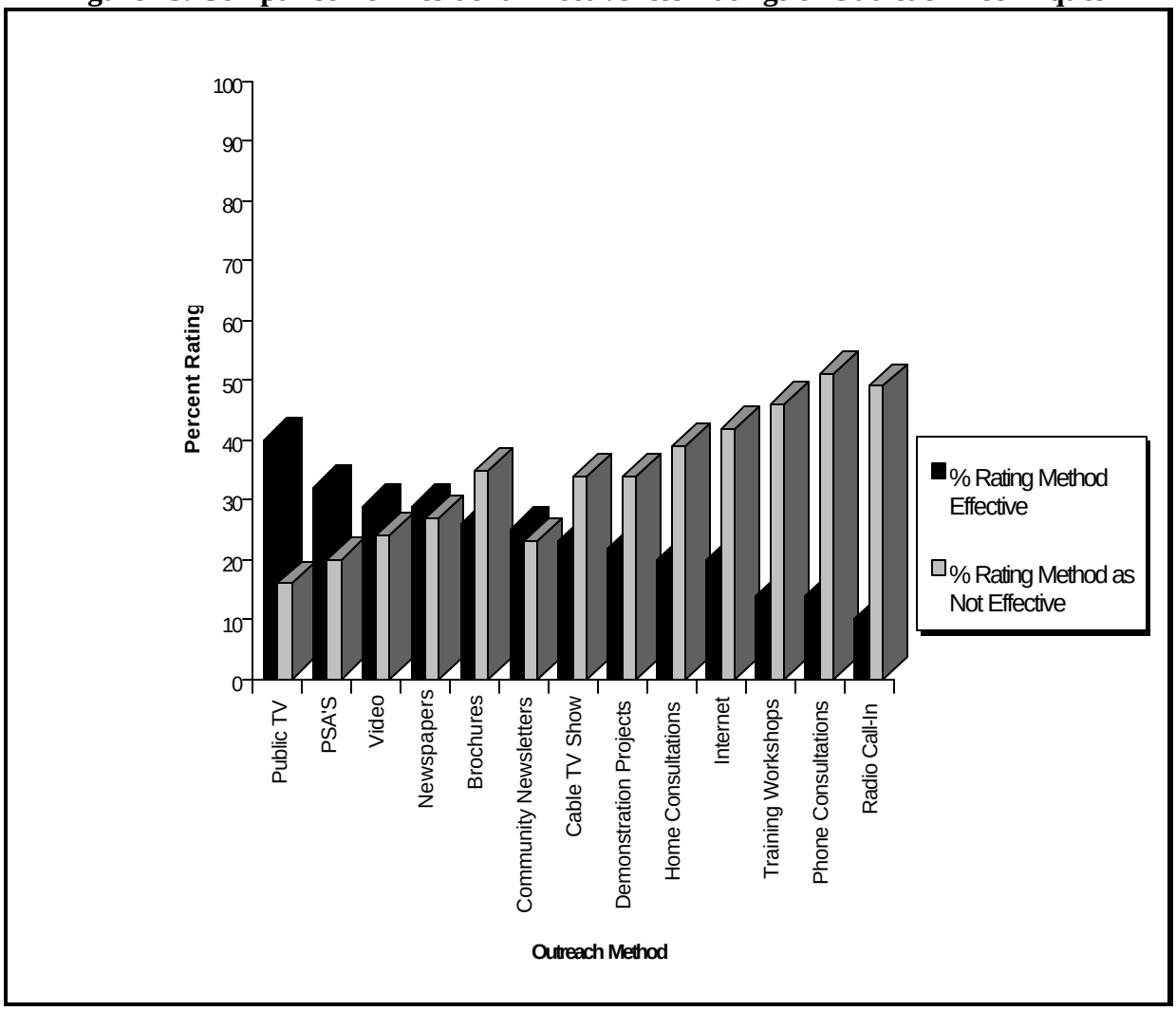


Note: The category "Supplemental advertisements in newspapers is incorporated into the results of the category "Newspapers".

Residents also appear to have a love/hate relationship with many of the outreach techniques being used by programs. Figure 15 shows what happens when we examine the resident survey results in terms of the percent rating a method as effective (a score of 7-10 on a ten-point scale) or not effective (a score of 1-3 on a ten-point scale).

Outreach techniques that required more particpatory effort seemed to be popular with a small segment of the local residents, but of little or no interest to a much larger portion of the population. Home consultations, training workshops and phone consultations all received the highest disapproval ratings (40% or more). Internet websites also received a high disapproval rating that might be attributable to a lack of computer access.

Figure 15. Comparison of Resident Effectiveness Ratings of Outreach Techniques



4.0 Program Survey Results

The second part of our project was to survey existing programs to find out what was currently being done to educate residents on nutrient management practices. Our goal was to survey at least fifty programs from around the country to determine the status of nutrient management education efforts and to identify innovative techniques that might be employed in the Bay area. This information was then compared to the outreach preferences by residents to see if current outreach techniques were effective in reaching the target audience.

Each program survey respondent was asked questions regarding annual expenditure, staffing resources, what kind of information their program provided, and outreach techniques they used. Program managers were also asked to rate the effectiveness of outreach techniques from their own perspective, as well as to provide information on effectiveness surveys that may have been performed. A final series of open-ended questions invited respondents to describe innovative programs that they were using, and what they might do the same or differently if they were to begin their programs again.

Several important facts became evident from the analysis of the program surveys. First, most of the programs were poorly staffed (0.1 to 0.5 staff years) and devoted only a small portion of their time to nutrient education (Figure 16). In many cases, there were no specific programs regarding nutrient education for urban and suburban residents, and nutrient issues were addressed as part of a broader nonpoint source education campaign.

Figure 16. Staff Time Dedicated to Nutrient Education

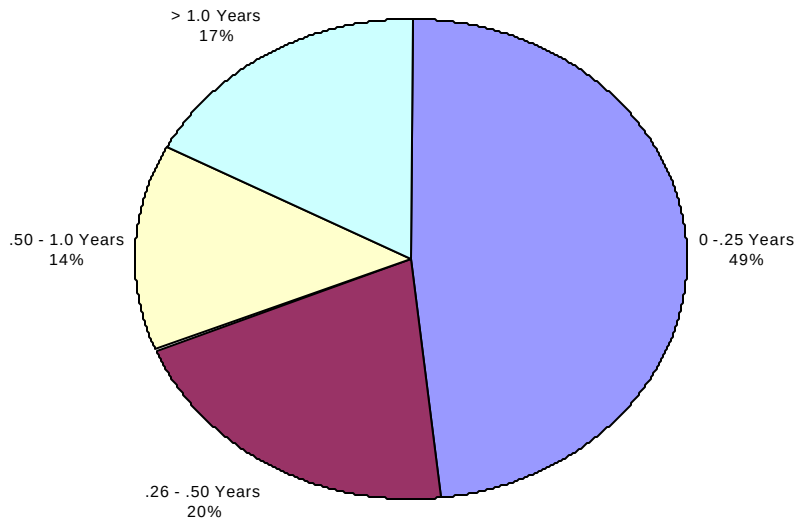
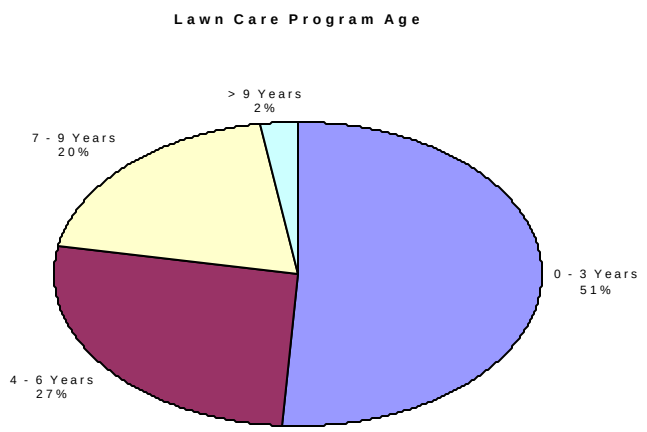
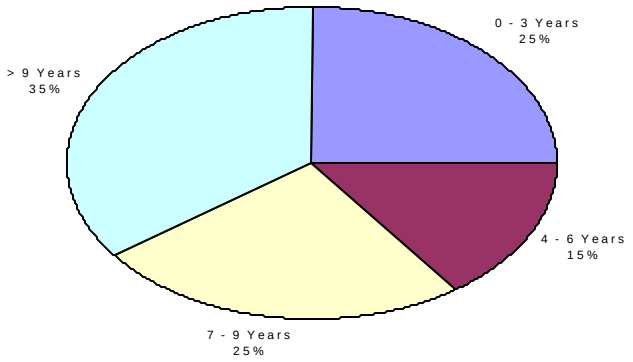


Figure 17
Age of Nutrient Education Programs

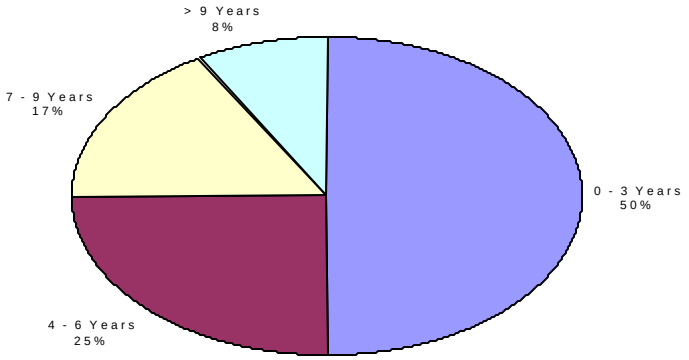
Lawn Care



Septic System



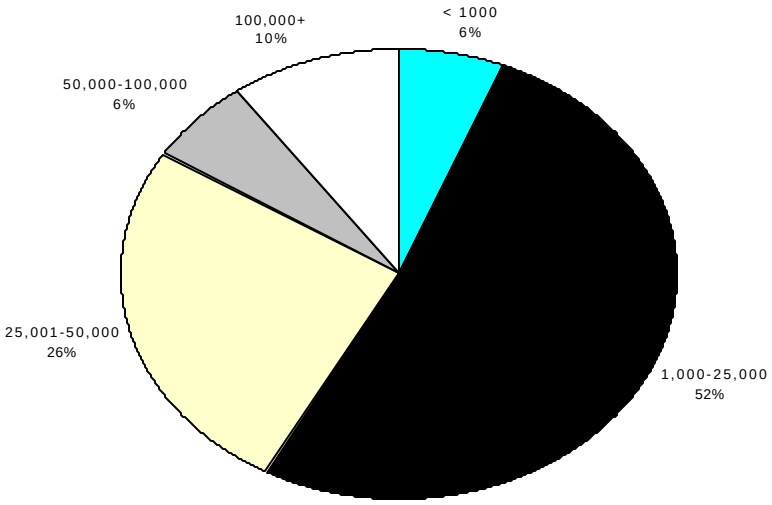
Pet Waste



Most nutrient education programs are also fairly new. According to the survey, most programs have existed only since the early 1990's, with most having been developed within the last five years. The reason most often mentioned for developing these programs was to comply with the educational requirements of the NPDES stormwater permit regulations. Because of the relative youth of nutrient education programs, few evaluations of their effectiveness at reaching residents have been performed. Figure 17 provides an overview of the age of three nutrient education program types (lawn care, septic, and pet waste). Of the three programs, septic education programs had been around for the longest amount of time, with some programs having been in existence for 20 years or more.

Typically, the budget for most of the nutrient education programs was quite small, with most within the $1,000-$25,000 range (Figure 18). Such limited budgets obviously dictate the scope and outreach techniques available to the program manager, as well as the results that outreach programs can hope to achieve. We found that few programs had the budgetary resources to utilize media outreach techniques, and instead, relied on cheaper flyers and brochures to disseminate information. This shortcoming was illustrated in the program survey, where the most popular response of program managers when asked what they would do differently if they started their program again was "Get more funding for our program so we can expand our outreach."

Figure 18. Budgets for Nutrient Education Programs



Program managers also assessed the effectiveness of the various outreach techniques they employed and the results are summarized in Table 8. The table provides information on the number of programs that used a particular outreach method and an average effectiveness rating. It should be noted that the effectiveness rating for an outreach technique is not based on actual utilization. For example, local newsletters received the highest average effectiveness rating, but were only used by seven programs. On the other hand, brochures/flyers were used by almost all the programs but program managers ranked them rather low as an effective outreach technique.

Table 8. Program Managers: Rating of the Effectiveness of Outreach Techniques

Nutrient Outreach Technique	Effectiveness Average	Programs Using Method
Local Newsletters/Newspapers	9	7
Home or Phone Consultation [a]	8.2	22
Information Distributed Upon Property Purchase [c]	7.8	9
Training Workshops	7.8	36
Visits to Schools or Community Groups [a]	7.2	33
Newspapers	7	13
Demonstration Projects [a]	6.7	23
Internet Website	6.2	16
Television (Cable and PSA's)	6.2	18
Radio	6.1	19
Flyers/Brochures	5.9	47
Educational Videos	5.6	19
Partnerships with Stores that Sell Lawn Care Products [b]	4.8	16
Signs in Parks or Along Paths [d]		2

[a] Lawn Care and Septic Systems sections only
[b] Lawn Care section only
[c] Septic Systems section only.
[d] Pet Waste section only.

The program survey responses were used to create an index of outreach utilization for the fourteen techniques that were also evaluated by the residents who participated in the phone survey. This index was developed by dividing the number of programs that used a particular outreach method by the total number of program survey participants (n = 50). For example, 47 programs indicated that they used brochures or flyers as part of their outreach, and dividing by fifty results in a utilization index rating of 9.4. To derive ratings for outreach techniques not included in the original program survey, survey results were analyzed for a detailed description of each outreach technique. If enough information existed, a response was refined into individual categories that corresponded with the outreach techniques named in the resident survey. The results for all of the outreach techniques are presented in Table 9.

Table 9. Program Managers: Utilization Index for Outreach Techniques Used	
Mean Index of Use Scores for Outreach Techniques	
Outreach Method	Utilization Rating
Brochures	9.4
Training Workshops	7.2
Demonstration Projects	4.6
Home Consultations	4.4
Phone Consultations	4.4
Video	3.8
Radio Ads	3.8
Internet Website	3.2
Newspapers	2.6
Cable TV	2.2
PSA's on TV	1.4
Community Newsletters	1.4
Public TV Show	0
Radio Call-In	0
Supplements in Newspapers	N/A

As can be seen, techniques that were seen as interactive tended to be utilized more often by program managers. This reflects the fact that much of the educational effort currently being done currently is directed toward the retail sector (commercial distributors or those who perform the service for a living) and those residents who are motivated to seek advice on nutrient management.

We found that the process of selecting outreach techniques to use was a difficult decision for program managers. Often the outreach technique options available are limited by program and staff resources. Many outreach techniques currently used were chosen due to budgetary restraints, not personal preference. This was evident when program managers indicated that they used an outreach method, but gave it a low or medium effectiveness rating.

Some program managers also pointed out that while some outreach techniques were highly effective at changing behaviors, they could only reach a very limited section of the population. Training workshops were widely regarded by program managers as highly effective, but it was noted that they had a number of limitations. Among the limitations mentioned were poor attendance rates and the inability of workshops to reach large segments of the general watershed population.

Another point that was evident from the program surveys was that the effectiveness of certain outreach techniques depended on prior watershed awareness. In those geographic regions where a higher stewardship ethic had been fostered around a high profile water resource such as salmon streams, the Chesapeake Bay or San Francisco Bay, workshops and meetings were reported to be much more popular and better attended.

A consistent problem reported by program managers was poor quality and inconsistent messages.

This was particularly true for brochures. Brochures are a popular method for disseminating information because they are cheap and easy to produce, but many lacked a clear-cut message or failed to link practices to water quality problems. Relating issues such as pet waste to beach closures tends to drive home stewardship messages to residents much more effectively than wishy -washy statements like "use less fertilizer." In addition, many materials tend to pack too many messages into one publication, thereby diluting the overall message or making informational packets that are over-loaded with information.

An excessive amount of information often overwhelms the average resident, reducing the likelihood of any of the messages will produce a desired change in behavior. While it is understandable that programs try to pack as much information or address as many pollutants as possible in one publication to reduce costs, the average resident often does not have the time or patience to wade through reams of material on nutrient management techniques. Figure 19 provides an example of one brochure that exemplifies an ambiguous and poorly crafted nutrient management message. Other examples are provided in Appendix D.

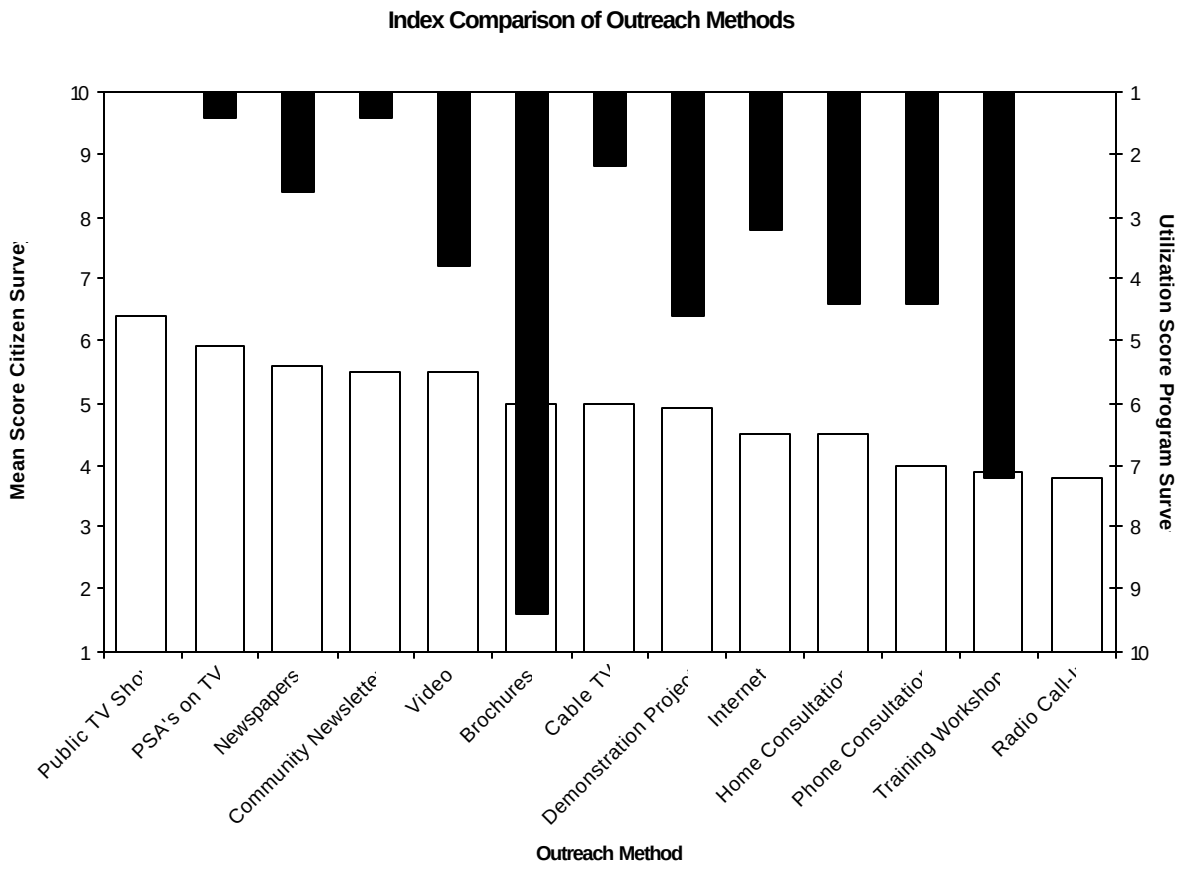
Figure 19
An example of a Nutrient Education Brochure

5.0 Discussion

A. Comparison of Resident Outreach Preferences with Actual Utilization

A comparison of resident outreach preferences with the utilization index derived from the program manager surveys is graphically represented in Figure 20. The mean score that residents assigned an outreach method is plotted on the left, and the utilization index derived from the program surveys is plotted on the right. From this chart, it is apparent that there are sharp differences between the outreach techniques that residents hear and respond to and what outreach techniques are currently used.

Figure 21



Interactive events such as demonstration projects, meetings, or training workshops, were preferred by program managers, but were all rated at the lower end of the effectiveness scale by Chesapeake Bay area residents. There are several reasons that may account for this gap. Interactive events require a time commitment that the average resident may not be willing to expend, especially on weekends. Also, the media that reach most residents (television, radio, and newspapers) are not used to advertise these events.

The outreach techniques that residents seem to prefer are currently underutilized by most nutrient education programs. The Center compared our results to several other surveys to determine what were the most influential techniques for getting messages to residents. Table 10 contains a summary of those results.

Table 10
Ranking of Outreach Techniques Considered Most Influential by Residents
Eight Surveys

	This Survey	**2**	**3**	**4**	**5**	**6**	**7**	**8**
More	TV	TV ad	Direct Mail	TV Ad	TV	TV	TV	Newspaper
	TV ad	TV	TV ad	Stencils	Paper	Paper	Paper	Direct Mail
-	Newspaper	Newspaper	Newspaper	Billboard	Radio	Cable TV	News-letter	TV
Influence	Local paper	Radio Ad	Radio	Local paper	Magazine	Local paper	Brochur e	Neighbors
	Video	Brochure	TV	Brochure	Neighbors	News-letter	Site Visit	Ext Service
¶	Brochure	Radio news	Bill Insert	Radio Ad	School	Video	Video	Radio
Less	Local cable	Paper Ad	Newsletter	Bus Sign	Billboard	Meeting s	Meeting	Meeting
	Meeting	Billboard	Local paper	Direct Mail	Brochure	Brochur e	- -	Local cable
	Reference	7	1	2	15	16	17	14

As can be seen, television and television advertisements were consistently rated as the most popular techniques for receiving water quality messages. By way of comparison, television outreach was one of the least used outreach techniques according to program managers. One explanation for this is that limited budget resources prevent most programs from utilizing television. Lack of funding may also explain the popularity among program managers of brochures/flyers and training workshops because they are relatively inexpensive to produce when compared to purchasing advertising space or producing videos.

The results of these surveys do not imply nutrient education programs cannot achieve results. Indeed, these programs provide an excellent source of information for that portion of the population that is seeking to make changes and use more environmentally sound practices. They may also ultimately influence resident behavior indirectly, through word of mouth from one neighbor to another. The effects of these education efforts may require long periods of time to bear fruit, but there is some

evidence that the efforts of these programs can influence resident behaviors.

Innovative outreach efforts tend to fall into two broad categories that we term Targeted Media Campaigns and Intensive Training Programs. The focus of both types of efforts is to familiarize residents with general themes of nutrient management and to promote simple changes in behavior that can improve local water quality.

B. Effectiveness of Targeted Media Campaigns

The first innovative outreach category is the targeted media campaign. These campaigns are focused on a wide audience, are well funded and utilize mass media in order to communicate messages through several different media. Generally, the campaigns utilize a mix of TV, radio and newspaper ads, as well as signs. The campaigns employ a humorous message and focus on one aspect of nutrient control in order to keep from diluting the message. The main goal of this type of outreach is to increase resident awareness of behaviors that can reduce nutrient runoff and to develop stronger associations between resident actions and impacts on water quality. Table 11 provides three assessments of the effectiveness of targeted media campaigns in changing resident behavior.

Table 11
Effectiveness of Targeted Media Campaigns in Changing Watershed Behaviors: Before and After Market Surveys

Location and Nature of Targeted Campaign	**Effectiveness of Campaign**
San Francisco Radio, TV and Buses (5)	Awareness increased 10-15% Homeowners who reduced lawn chemicals shifted from 2 to 5%
Los Angeles Radio and Newspapers (15)	Best recall: motor oil and litter (over 40%) Worst recall: fertilizer and dog droppings (<10 %) Drop in car washing, oil changing, radiator draining about 5 to 7% Greater self-reporting of polluting behaviors: dropping cigarette butts, littering, watering and letting water run on street, hosing off driveways into the street (10% or more)
Oregon Radio, TV (1)	19% reported a change in "behaviors"–changes included being more careful about what goes down drain, increasing recycling and composting, using more nature-friendly products etc.

C. Effectiveness of Intensive Training Programs

The second category of innovative outreach techniques is intensive training programs. This outreach technique is characterized by more hands-on, interactive events that require significant amounts of time for both the program manager and participants. The training is typically directed toward residents who have expressed an interest in learning more about some aspect of nutrient management, often involving lawn care or septic systems. Commercial vendors such as septic cleaning companies and lawn care professionals are also common targets. The main goal is to influence the behavior of those who have

expressed a commitment to explore better practices or who provide professional services affecting nutrients. The effectiveness of intensive training is difficult to gauge since participants are not being asked about their awareness as much as about their implementation of nutrient practices (Table 12).

Table 12
Effectiveness of Intensive Training in Changing Selected Watershed Behaviors

Location and Nature of Training Campaign	Effectiveness of Intensive Training
Maryland Direct Homeowner (18)	10% shift from self to commercial car washing. No change in fertilizer timing or rates. Better claims of product disposal.
Florida Master Gardener (11)	No significant change in fertilization frequency after program. Some changes in lower rates, labels, slow release (8 to 15%). Major changes in reduced pesticide use (10 to 40%).
Virginia Master Gardener (4)	30 to 50% increase in soil testing, fertilizer timing and aeration. 10% increase in grass clippings and 10% decrease in fertilizer rate.

Based on these surveys, it is evident that intensive training can change many lawn care practices that are used by participants. At the same time, intensive training has often failed to reduce the rate of fertilization on home lawns, and in some cases, has been found to actually produced a modest increase in the overall fertilization rate (11).

6.0 Innovative Nutrient Education Programs and Advertising Campaigns

As part of the program survey, we tried to identify unique and innovative nutrient education programs. The innovative programs described below generally involve broad campaigns that use several media outlets or require an expressed commitment from residents who work closely with program managers. Sample material from some of these campaigns can be found in Appendix E.

"Let's Be Partners in Reducing Water Pollution" developed by the Baltimore County, Maryland, Department of Environmental Protection and Resource Management (DEPRM). In this program, citizens are invited to pledge their willingness to engage in activities around their homes that will reduce water pollution. They complete a worksheet on which they choose from a list of "Pledge Action Choices," including vegetation planting, mulching, reducing existing lawn area, using less or no fertilizer, use biological, mechanical, or cultural pest control methods over chemical methods, reusing yard waste, and diverting stormwater runoff. In addition to this form, citizens complete an "Environmental Partnership Pledge" that resembles a certificate and formalizes their commitment to these activities. An "Enviro-Tips" telephone information line and related brochures are provided for additional water pollution control ideas. Copies of the worksheet and certificate can be found in Appendix E.

"What Else" campaign developed by USDA Natural Resources Conservation Service (NRCS), Topeka, Kansas. This comprehensive program was developed to determine what more could be done to reach the target audience aside from traditional newsletters and meetings. It includes television news stories, storm drain stenciling, movie theater slides, a website (www.sccdistrict@cjnetworks.com), a public service announcement, trade show appearances, outreach to small watersheds, a resource directory, and septic system repair cost sharing. Perhaps the most innovative aspects of this campaign are the television news stories and the movie theater slides. A relationship has been cultivated with four local television networks in which two or three annual NRCS events are televised on the daily news programs as well as cable. Advertising slides shown in movie theaters have been used for public services announcements. See Appendix E.

Lawn Care and Septic System Techniques used by Washington State Sea Grant, University of Washington. In educating citizens about how lawn fertilizers are carried into local waterways, the staff of Washington State Sea Grant apply a bright blue die to fertilizer, allow citizens to apply the fertilizer to their lawns, and watch while sprinkler water moves the dyed fertilizer away. Their sixty-foot long, crawl through septic system is popular at fairs and festivals. For further information, contact Washington State Sea Grant Program, 11840 North Highway 101, Shelton, WA 98584.

Discounts on Septic Pumpouts reported by Maine Department of Environmental Protection (DEP). In this program, a group of septic system users are organized and receive a group discount from a septic pumpout service. Maine DEP has developed a poster with a coupon offering a discount on septic pumpouts. For further information, contact Maine DEP at 1235 Central Drive, Skyway Park, Presque Isle, Maine 04769-2094.

"Earth friendly garden tour" given by Thurston County Department of Water and Waste Management (DWWM), Olympia, Washington. During the annual garden show, the DWWM organizes a tour of 8 to 10 earth friendly gardens emphasizing native plants, water conservation, composting, organic gardening, and natural, slow-release fertilizers. To find out more about the garden tours, contact Thurston County DWWM at 921 Lakeridge Drive, SW, Building 4, Room 100, Olympia, WA 98502.

"Pet Pledge Program" developed by Los Angeles County Department of Public Works, Alhambra, California. In this program, a partnership has been created with three local Petco pet supply stores where dogs pledge that they will not pollute by having the owner pick up after them. Petco also distributes a "Tips" card with each purchase. Contact the Environmental Programs Division of the LA County DPW at 900 S. Fremont Avenue, Alhambra, CA 91803-1331.

"Master Gardener Training" and "EASY Program" by Virginia Cooperative Extension, Blacksburg, Virginia. Master Gardener Training, which is also given by other cooperative extensions, involves training individuals in pesticide safety, lawn establishment and maintenance, and water quality. Once trained, these individuals may join the EASY Program (Environmental Answers for a Sound Yard) where they will receive additional training in site evaluation, soil testing, weed and pest control, and proper fertilization, irrigation, and mowing. In the EASY Program, homeowners make a one-year commitment to follow the recommendations of the Master Gardener. Three home visits and at least three phone contacts between visits are made by the Master Gardeners as well as community meetings to encourage community awareness about lawn care practices.

Bay Area Stormwater Management Agencies Association (BASMAA) Spring 1997 Regional Advertising Campaign, Alameda, California. The two main objectives of this broad campaign were to make residents *think* about their lawn care practices and *feel* that they can improve the quality of their local streams and the San Francisco Bay. Two groups were targeted, homeowners 35-54 and adults 55-64, for a series of radio advertisements that was augmented with newspaper and magazine ads, billboards, bus sides, bus shelters, an ad that ran on a radio station website, and a poster that was used during community events. Three 60-second radio commercials ran on five stations and were entitled "Laying It On Thick," "Bug Blanket," and "Wanna Get the Guide?" The ads ran in the spring mainly on Thursdays and Sundays to build awareness before and during the weekend when most lawn care takes place. Several counties bolstered this campaign with similar media efforts. The results of surveys conducted to show changes in awareness indicated an increase in awareness and recall of fertilizers and pesticides as contributors to water pollution. A copy of a bus shelter ad can be found in Appendix E.

Water-wise Gardener Program implemented by Prince William County, Virginia, **Cooperative Extension Service**. This program educates and trains homeowners in environmentally friendly lawn care practices. Each step in this five-step program results in an increased level of commitment and effort on the part of Extension staff, volunteers, and the homeowner. The first step involves lawn and garden field days, workshops, and seminars to attract and educate homeowners. Next, homeowners volunteer to implement what they've learned on their own lawns with the help of a trained Master Gardener. Their lawns become "volunteer lawns." The third step is where volunteer lawns become "demonstration lawns." In this step, homeowners have gained knowledge and experience and are

willing to participate in educating the public. In the fourth step, demonstration lawn homeowners take the Master Gardener Training where they will work with beginner volunteer homeowners. The fifth step in this comprehensive program is when the program has reached saturation in a community and the community feels vested in the process and wishes to continue it. At this time the Extension staff turn the program over to the community.

COOL (Carry One On Leash) Dog Program developed by King County Water and Land Resources Division, Seattle, Washington. This program educates the public about the effects of dog waste on water quality by encouraging dog owners to tie a plastic bag to their dog's leash when they take them for walks. A flyer was prepared to educate dog owners about water quality and proper pet waste disposal. A copy of the website message can be found in Appendix E. For further information, contact the King County Water and Land Resources Division at 700 Fifth Avenue, Suite 2200, Seattle, WA 98104-5022.

Environmental Landscape Management Program developed by the Florida Cooperative Extension Service, Gainesville, FL. This objective of this program is to promote the use of environmentally sound practices in the design and maintenance of Florida landscapes. Practices include energy and water conservation, pest control, yard waste recycling, and attracting wildlife. A series of one-day workshops were targeted to professionals in the lawn care, landscaping, and pest control fields, as well as property management and local and state maintenance personnel. A study of the program concluded that the practices were well received and a pattern of increased use was indicated six months after the workshops. For more information, contact the Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL 32611.

The innovative nutrient education programs highlighted all involve more intensive interaction with residents as part of their plan to change nutrient behaviors. Another method is through creative advertising campaigns designed to increase the awareness of residents about nutrients and stormwater pollution. The most effective campaigns use short, humorous ads focused on the effects of one particular behavior to increase nutrient awareness. Figure 22 provides a good example of the use of humor to create a memorable message regarding pet waste and water quality. Appendix F contains additional material from ad campaigns that used creative images or inventive slogans to enhance the appeal of the nutrient outreach message.

Figure 22
An example of a Creative Outreach Advertisement
Source: Water Quality Consortium, King County, Washington.

7.0 Recommendations to Enhance Nutrient Education Programs

Based on our surveys a series of recommendations have been made to enhance the effectiveness of nutrient education programs in the Chesapeake Bay. These recommendations are designed as guidelines for improving programs, and are written to apply to both new and existing nutrient education projects.

1. Most programs traditionally focus on lawn issues such as fertilizer and pesticide use, but it may be beneficial to target other nutrient producing behaviors as well (e.g., Septic Systems, Car-washing, Dog-Walking). Educating residents to change these behaviors could produce a larger nutrient reduction than from concentrating on lawn care practices alone.

2. A simple, clear and direct message is essential for nutrient education, especially in relation to lawn care. Recommendations should be specific (time of year to fertilize, having soil tested prior to applying fertilizer, etc.) to provide residents with definite actions to perform. It is also important to keep messages simple and funny to attract and hold attention. Radio and television spots should be short and should focus on one behavior to keep from diluting the nutrient message.

3. Since most individual nutrient education programs operate on small budgets and lack program resources, community resources should be pooled to create a regional nutrient education campaign. Such a campaign could include creative public service announcements or use of commercial television spots to target the largest audience. Program managers should consider hiring professional ad agencies to create messages with the broadest appeal.

4. Nutrient education programs need to develop a stronger message about the storm drain-water quality connection. Since the greatest shift in behaviors noted in many watershed campaigns comes from linking water quality to some undesirable episode (i.e., beach closures, fish kills), programs should focus on how nutrients can affect issues that residents feel are important such as public health or taxes.

5. While some outreach techniques are better than others, none can reach the entire population alone. Therefore, the use of multiple forms of media (TV, Radio and Newspapers) improves the likelihood of reaching the largest amount of residents.

6. Radio and television advertisements and PSA's should be timed to appeal to specific target audiences. Since many of the behaviors that affect nutrient levels can be tied to certain age groups or education levels, presenting ads at appropriate times will ensure that those residents are exposed to the nutrient message. As an example, if the main target audience is males between 35-54, running messages during sporting events might be more effective to attract their attention.

7. Since many private sector companies stand to benefit from changes in nutrient behaviors (e.g.,

Lawn Care Companies, Septic Cleaners, Pet Store Owners), intensive training targeted toward these groups may provide a strong nutrient outreach opportunity. Our survey shows that these groups represent a substantial information source for residents of the Chesapeake Bay area.

8. Many current nutrient education messages impart highly complex information to homeowners that is designed to change behavior. This information is best presented in small, colorful and durable information packets that are separate from the awareness message. All media and printed matter should include phone information on how to obtain these information packets.

9. Program managers should ensure the consistency of the nutrient messages being transmitted. Nothing confuses people more than receiving several pieces of information on a subject with differing application levels or conflicting guidance on proper behavior.

10. Given that most nutrient behaviors are deeply-rooted and that target audiences are often older males, the traditional model of reaching residents through education of their children may not be as effective as once thought (e.g., recycling). Children are often used to convey so many messages that nutrient messages may become just the next "theme of the week."

11. Television is the prime media for influencing behaviors, but careful choices must be made on what form of television is selected. Our survey shows that community cable access channels are much less effective than commercial or public television channels. Program managers might consider the use of cable networks targeted for specific audiences (Home and Garden Television, Discovery Channel, etc.) . Information placed in thematic shows that address house, garden and lawn issues can provide an outlet for spreading the nutrient management message. Partnerships could be forged with cable companies to highlight shows that might be of interest to homeowners and that contain information on appropriate nutrient behaviors.

12. Direct mail can be a useful outreach tool, particularly if those mailings include free eye-catching stuff, such as keychains or refrigerator magnets, instead of plain brochures or flyers.

13. It is important to keep in mind the demographics of the watershed when adapting outreach techniques. If a large portion of the residents speak English as a second language, it is essential to produce materials in other languages. Nutrient programs should consider alternative communication techniques in order to reach particular groups (e.g., churches, African American newspapers, Spanish speaking television).

14. To get a better handle on what messages work, program managers should conduct "before and after" market surveys to determine penetration and behavior changes. It may be useful to focus nutrient education efforts on smaller subwatersheds in those cases where large nutrient reductions may be realized. To economize, these education efforts may be tied to a watershed prioritizing process.

15. It is important to set reasonable expectations as to the effectiveness of nutrient education

campaigns, as most studies have shown only a modest change in resident behaviors. Consequently, a long term commitment needs to be made for nutrient education.

16. There is a strong role for intensive training for homeowners and private companies. This type of outreach has a role in expanding the number of avenues for communicating the nutrient message (i.e., MasterGardeners), as well as providing more detailed information for those residents who have are trying to implement nutrient control practices. However, these programs need to expand beyond their current focus and develop specific nutrient reduction techniques.

17. There is potential for developing partnerships with large retail lawn and garden centers to promote nutrient education messages. Our survey shows that many residents rely on these locations as their primary source of information. These partnerships may be difficult since a reduction in fertilizer use message may conflict with the need for greater sales of theses retailers.

While this project has focused on three behaviors that affect nutrient management, there are a number of other watershed behaviors that may also contribute nutrients to the Chesapeake Bay. In particular, the role of car washing and car maintenance behavior needs to be explored. Research is needed to quantify basic behaviors in regard to the car, including oil and antifreeze disposal methods, car washing practices, car leakage rates and home snow removal methods.

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