

Homeowner behavior change relating to septic system maintenance in coastal South Carolina

By: Kecil John, MS Candidate, University of Michigan School for
Environment and Sustainability
Advisor: Dr. Victoria Campbell-Arvai

TABLE OF CONTENTS

Abstract.....	3
1. Introduction.....	3
1.1 Septic systems and water pollution.....	4
1.2 Past Campaigns.....	5
2. Literature Review.....	7
2.1 Decision Theory	7
2.2 Social Norms.....	9
3. Methods.....	10
3.1 Data Collection.....	10
3.2 Analysis Methods.....	11
4. Results	11
4.1 Barriers	15
4.2 Action Indicators	16
4.3 Actions	16
4.4 Communication	17
4.4.1 Current Communication Messaging	18
4.4.2 Current Communication Methods	18
5. Discussion.....	19
5.1 Recommendations on Messaging	23
6. Conclusion	24
Appendix 1: Interview Questions	26
Appendix 2: Codebook	27
References	30

Abstract

South Carolina is experiencing increased cases of fecal coliform contamination in its waterways. This has led to beach closures and temporary fishing bans along the coastal regions. Clemson Extension's Carolina Clear Program has identified fecal coliform contamination as a top priority in their mission to protect the states' water. A key source of fecal coliform is leaking septic systems, individually owned waste disposal systems. Carolina Clear sought input for the creation of a communications campaign targeted at coastal homeowners to encourage septic system maintenance behavior change. The researcher conducted a literature review of relevant behavioral change models such as the Norm Activation Model and the Model of Reasonable Environmental Behavior. They then looked at past septic system engagement programs across the US and found that few such programs exist without financial incentives. The researcher conducted in-person and telephone interviews with South Carolina coastal stormwater managers in order to identify barriers to septic system maintenance specific to the region. This interview data was used to generate a decision-making model to illustrate decision-making of septic system homeowners. It was found that all homeowners had difficulty maintaining their septic systems, regardless of socioeconomic status or community makeup. Recommendations for the communications campaign, including copy and design suggestions, were developed using data from the interviews and the model. The researcher proposes that in order to reach a broad audience, the communication campaign should focus on daily, low-cost actions and a wide variety of media channels.

1. Introduction

Contamination from malfunctioning septic sewers is affecting human and ecosystem health in coastal South Carolina. Rising sea levels combined with poor system maintenance by homeowners have led to an increase in fecal coliform concentrations above the acceptable national limit¹. Resulting beach closures have led to economic impacts on small businesses and pose health risks to the community. Although this issue is becoming more well-known over time², there is little research done on homeowners' towards septic system maintenance behavior. This paper describes the development of a communication based pro-environmental behavior change campaign designed for Clemson Extension's Carolina Clear program, to be used by their Stormwater Consortium.

As the goal of the campaign is change the behavior of homeowners, decision-making theory was used to understand reasoning behind actions or inactions. Behavioral models such as the Norm Activation Model³ and the Model of Reasonable Environmental Behavior⁴ were studied to gain an understanding of homeowners' decision-making processes. The influence of social norms⁵ on individual behavior was also considered. As Carolina Clear had already communicated the type of materials they were interested in producing, including print media

such as flyers, billboards, as well as television and radio PSAs, the research was focused on developing message content.

In order to determine the current state of septic system outreach within the Stormwater Consortium, the researcher conducted interviews with regional stormwater managers. These managers offered insight into homeowners' beliefs and behaviors around septic systems. The information from these interviews was used to construct a decision-making model to simulate how homeowners came to decisions on septic system maintenance. The communication campaign was designed to target key areas of the decision-making process in order to encourage preventative septic maintenance.

Coastal South Carolina is a diverse region, with communities that range from rural to urban and high income to low income. All of these populations have households that use septic systems. However, people from different regions and/or socioeconomic levels face different challenges based on opportunities and ability. Urban homeowners may not have sufficient acreage as laid out in state law⁶ to replace a failed septic system, while rural homeowners may not have the option to connect to municipal sewer systems, which are often seen as the best method for wastewater disposal by due to lower environmental impacts⁷, in cases of septic system failure. A homeowner's financial position affects their ability to maintain their home⁸. Home repair and structural upkeep, including septic-related maintenance, can be costly⁹. A wealthy individual might be able to afford septic system maintenance inspections or repairs more easily than an individual living around the poverty line. Race also plays a role in wastewater disposal systems. Historically black communities face unique septic challenges due to racial underbunding; where municipalities deliberately excluded minority communities from annexation and therefore denied them access to public utilities such as sewer systems¹⁰. As a result, many minority communities face unequal access to municipal sewers. Given the different opportunities and limitations seen caused by a homeowner's region, socioeconomic level, and race, these factors will be considered during this study in order to ensure the resulting campaign is appropriate for its audience.

1.1 Septic systems and water pollution

Septic systems make up a large percent of wastewater disposal in SC. As recently as 1980, 42% of houses used septic systems or cesspools instead of public sewers¹¹. Septic systems are composed of a septic tank, where solid waste accumulates and is gradually broken down by bacteria, and a drain field, where water from the septic tank is dispersed into the ground and filtered through soil to remove harmful bacteria before joining the watershed of the area¹²¹³. Malfunctioning septic systems disrupt this process and cause such bacteria to enter waterways, spreading pathogens such as *E. coli* and *Giardia spp.*¹⁴.

Septic system malfunctions are caused by multiple factors. The percolation tests used in the early 20th century to determine the location of septic systems on a property have since been

ruled inaccurate, and septic systems that were placed during this time often have poor soil drainage during periods of high rain¹⁵. Additionally, there are products that claim to maintain septic systems and prevent sewage blockages, but often these products are in fact detrimental to the health of a septic system¹⁶. Consumer purchase these under the assumption that they are maintaining their systems, when in fact they are doing the opposite. Increased consumption of so-called flushable wipes is another source of clogged pipes and backed-up septic systems¹⁷.

A leaking septic system can also be caused by a lack of professional maintenance. The South Carolina Department of Health and Environmental Control (DHEC) recommends that septic systems are inspected or pumped every three to five years, depending on the size of the system and number of inhabitants that use it¹⁸. If a tank is not pumped out in appropriate time intervals, solid waste and scum can build up and overflow into the drain field¹⁹. The drain field then becomes oversaturated, causing fecal coliform to stay in surface water and leach into waterways.

Several environmental factors are exacerbating septic system failure in coastal South Carolina today. Climate change is causing rising sea levels and an increase in extreme weather events such as hurricanes and flooding²⁰. NOAA predicts that by the year 2045, the city of Charleston will experience up to 180 tidal floods²¹ per year. As the water tables rise, the coastal drain fields of septic systems are prone to flood. Flooded systems are unable to filter wastewater through soil, and instead the contaminated water enters local waterways.

Failing septic systems allow harmful bacteria from human waste to enter water systems, contaminating ecosystems and drinking water. These pathogens can have serious impacts on human health and ecological systems. Fecal coliform and the microorganisms that accompany it can cause disease in humans such as gastroenteritis, *E. coli*, hepatitis A, and *Salmonella*²². There has been an increase over time in waterborne disease outbreaks from individual wastewater systems²³. Studies have shown that septic system density is positively associated with cases of diarrhea²⁴. Eating fish and shellfish from contaminated waterways can be harmful as these animals accumulate high concentrations of harmful bacteria^{25,26}. Swimming in contaminated water has also been found to lead to negative health outcomes²⁷. Studies in coastal South Carolina found increased fecal coliform in urbanized areas²⁸, with the increase of coliform slowing significantly when centralized sewer systems replaced septic tanks. Furthermore, recent research has found that due to flaws in water testing protocols and procedures, current tests could be underrepresenting the level of fecal coliform in waterways²⁹.

1.2 Past Campaigns

Since the beginning of the environmental movement, much research has been done on pro-environmental behavior change campaigns in general. Early programs were education based, where a population was told facts about an environmental issue and given simple instructions on

pro-environmental actions such as recycling³⁰. This type of campaign was based on the assumption that as long as people know about an issue, they will change their behavior. It was reasoned that providing a person with knowledge will increase their awareness of an issue³¹. This in turn should lead to an attitude change, which will cause a change in the persons behavior³². Research has shown that this approach is ineffective at generating long-lasting behavior change in a population³³. It is theorized that this is because increasing a person's knowledge about a subject is not enough to cause behavior change³⁴. Other internal and external factors that affect behavior must be considered when designing a campaign. For this project the researcher reviewed the Norm Activation Model, the Hines Model, and Social Norm theory in order to gain knowledge on how to construct the campaign.

However, there has been little research on communication campaigns designed to encourage homeowners to engage in preemptive septic maintenance. While there are a growing number of these campaigns sponsored by local towns or municipalities, as well as the SepticSmart campaign by the EPA, most of them include grant funding to offset costs of septic system inspection and repair³⁵. Septic campaigns often cite the number of septic systems replaced as a measure of success³⁶, with most of the systems funded by the campaign itself. There is no effort made to distinguish results that could be the result of the communications of the campaign. This is the case for many behavior change initiatives; if a campaign includes workshops, media coverage, physical signage, and financial measures, it can be difficult to isolate the effects of each branch of the program³⁷. In order to evaluate a communication-based campaign, water testing should be conducted before and after homeowners were exposed to a campaign in order to see if there was a measurable drop in human fecal contamination.

The SepticSmart campaign is an EPA initiative to encourage septic system maintenance. Started in 2015, this yearly week-long campaign consists of print communication, social media and decisionmaker engagement. Eleven state governments and several municipalities issued proclamations in support of SepticSmart, but South Carolina was not among them. Partners and affiliates used social media to engage with communities, and many took advantage of SepticSmart-provided informational graphics. Although there was not a nationwide evaluation, several municipalities reported that homeowners who were exposed to SepticSmart material responded positively to the information and expressed interest in septic maintenance³⁸. There were also state reports about EPA-funded loan-forgiveness programs designed to enable low-income homeowners to replace failing septic systems³⁹. However, the researcher was unable to find any data directly linking increased water quality with SepticSmart communication. The only report that mentioned an increase in water quality involved an in-depth workshop where participants were exposed to detailed information that went far beyond SepticSmart materials⁴⁰. Materials from the online Outreach Toolkit SepticSmart initiative include magnets, posters, brochures, and door hangers. There were graphics promoting septic system maintenance that users could share on social media, often feature rhyming taglines such as 'Think at the Sink'⁴¹,

‘Shield Your Field’⁴², and ‘Protect It and Inspect it’⁴³. Additional material for rental property was produced, with placards landlords could place by the sink and in the bathroom that informed renters about septic systems. Most of these materials provided actions for people to follow in order to maintain the health of their septic systems. Most of these resources had both English and Spanish versions available to the public.

Carolina Clear’s current septic outreach consists mainly of interpersonal communication, where booths are set up at festivals or other local events and homeowners can interact directly with staff. There are a limited selection of print materials consisting mainly of informational half-page flyers. Carolina Clear decided to focus on septic system maintenance and repair for this campaign because their current approach does not seem to be effective; the organization reports that water testing in the area shows an increase in fecal coliform in waterways. This project aims to address the issue of fecal coliform contamination caused by septic system leakage by creating a communications campaign utilizing behavioral models, research on effective marketing techniques, and information on regional homeowner attitudes towards septic systems.

2. Literature Review

2.1 Decision Theory

Decision theory attempts to explain an individuals’ actions based on various factors⁴⁴. Humans are not perfectly rational and do not always make the ‘correct’ choice⁴⁵. Their decisions are influenced by experiences, beliefs, and knowledge on the subject. Individuals consider what they know about potential consequences of different behavioral options and weigh the likelihood of potential impacts against their personal values in order to come to a decision⁴⁶. By understanding the decision-making process behind an action, researchers gain insight into the situation and can identify potential interventions that guide individuals to make the desired or ‘correct’ decision. Prescriptive decision-making models in particular can be used to help people make better or ‘correct’ decisions by identifying ‘gaps’ between an individual’s perception of situation and the actual situation⁴⁷. Communication campaigns can encourage behavior change, or ‘correct’ decision making, by presenting information that bridges these gaps⁴⁸. Creating a model to simulate how homeowners make decisions on septic maintenance could help guide the content of the communications campaign.

Decision making processes can be broken down into pieces. When faced with a decision, an individual considers their different choices and the consequences of each choice. They weigh the magnitude of consequences against the likelihood that the consequence would come to pass⁴⁹. Factors such as knowledge, social norms, or personal values influence perceptions of consequences and outcomes⁵⁰. Behavioral decision-making models such as the NAM and the Model for Reasonable Environmental Behavior, discussed in more detail below, lay out general decision-making models for pro-environmental behavior.

Norm Activation Model (NAM)

The first model that the researcher looked at was the Norm Activation Model. The NAM model (Figure 1) ⁵¹ is one way to explain how individuals decide whether to engage in pro-environmental behaviors. It includes variables such as *awareness of consequences* and *ascription of personal responsibility* that were not considered in early behavioral models. *Awareness of consequences* describes when an individual is knowledgeable about the social, ecological, or health-related effects of an action, while *ascription of personal responsibility* is when an individual feels responsible for such consequences. An individual's *personal norms* are their belief that an action is right or wrong. Finally, the *prosocial interactions and behaviors* are the desired outcomes of the decision-making process.

The model theorizes that if a person is aware of the consequences of a behavior, and if they feel responsible for the consequences, they will adjust their personal norms so as to exhibit positive behavior⁵². For example, in a study on yard burning, participants who were aware of the negative consequences of yard burning and took responsibility for yard burning and the subsequent consequences were less likely to engage in yard burning⁵³. Recent literature supports a mediating model, where awareness of consequences must come before ascription of personal responsibility⁵⁴ and any corresponding actions. This has considerable implications for behavior change campaigns, as it would indicate that information on negative outcomes could be a key part of any communications campaign.

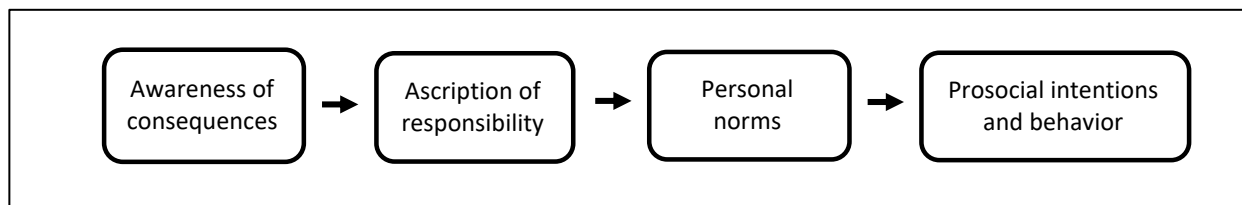


Figure 1: Norm Activation Model of Prosocial Behavior as a mediator model, as proposed by Groot & Steg, 2009⁵⁵

There is a precedent of adapting the Norm Activation Model to study specific pro-environmental behaviors. Researchers were able to accurately predict attendance of an environmental convention using a modified NAM that included new variables such as social norms and anticipated feelings of guilt or pride⁵⁶. Other studies use a modified NAM to examine the use of public transportation⁵⁷. By adapting the NAM, these studies were able to predict pro-environmental decision making and recommend actions that organizations could take to increase the desired behavior (i.e. convention attendance and public transit).

Model of Reasonable Environmental Behavior (Hines Model)

Another relevant model to the campaign was the Model of Reasonable Environmental Behavior, also called the Hines Model. This model⁵⁸ (Figure 2) is a result of a metaanalysis of environmental behavior research. It separates different variables that influence an individual's behavior into groups based on shared characteristics. *Psycho-social variables* (attitudes, locus of control, and personal responsibility) pertain to an individual's personality, while *cognitive variables* (action skills, knowledge of strategies, knowledge of issues) relate to an individual's knowledge about an issue⁵⁹. These two groups come together to influence a person's *intention to act*. Other factors such as demographics, finances, and resources are grouped as *situational factors* that moderate behavioral outcomes. These variables are applicable to septic system maintenance, with psycho-social variables corresponding to attitudes on septic maintenance and homeowners' views on responsibility. Cognitive variables correspond to knowledge of appropriate actions and impacts of septic failure, while situational factors such as finance are highly influential on eventual behavior.

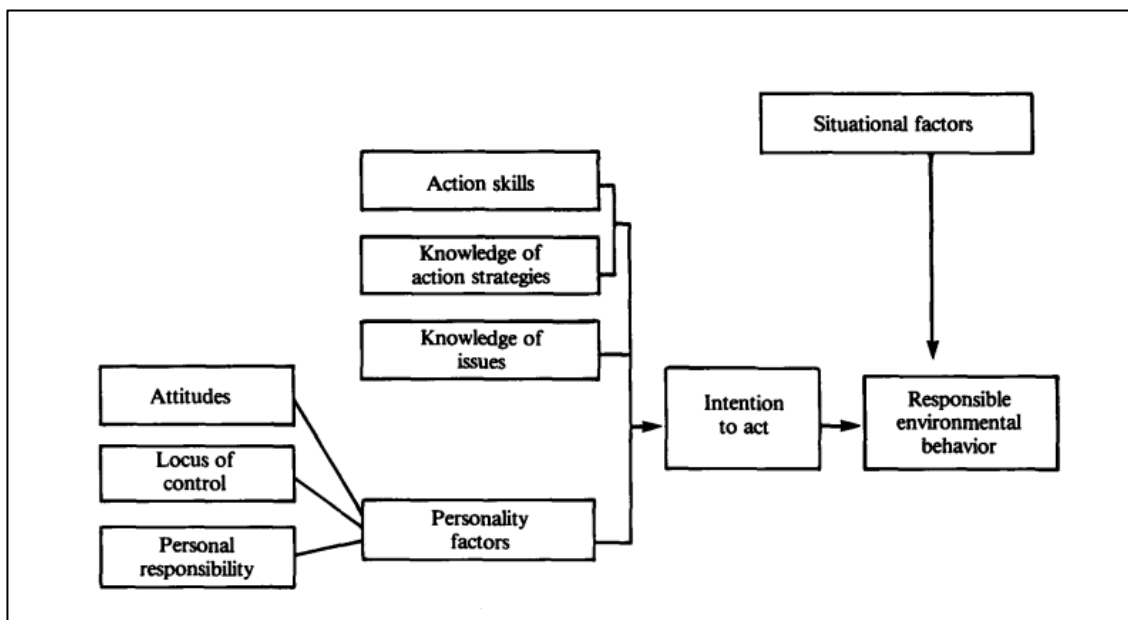


Figure 2: Model of Reasonable Environmental Behavior (Hines et al., 1987).

2.2 Social Norms

The researcher also considered the theory of social norms when looking at homeowner behavior. Social norms are unofficial statements that regulate behavior within a society⁶⁰. A norm does not necessarily align with the 'correct' or sustainable attitude⁶¹. *Injunctive Norms* are behaviors that are approved or accepted⁶², while *descriptive Norms* are behaviors that are usually engaged⁶³. The portrayal of norms is a key component in communication campaigns, as it models the desired behavior. Research has shown that the most effective type of pro-

environmental media communication shows an alignment of injunctive and descriptive norms⁶⁴. A study on the theft of petrified wood in Arizona's Petrified Forest National Park showed that messages on descriptive norms were more effective than messages on injunctive norms⁶⁵. Showing descriptive norms that go against the desired behavior can have unintentional consequences, as it shows viewers that an undesirable behavior is practiced by many people. This can be internalized by actors and have a negative overall effect on behavior⁶⁶. Alternatively, negative behavior can be significantly reduced if the injunctive norm is shown in media alongside the descriptive norm⁶⁷. In the case of septic system maintenance, the injunctive norm that people hear might be to get a system inspected regularly, but the descriptive norm is that people only call the septic system company when there is an issue.

3. Methods

3.1 Data Collection

In August 2019, the research conducted interviews with coastal stormwater professionals in South Carolina. Areas covered included Hilton Head, Hollywood, Myrtle Beach, Bluffton, Beaufort, metro Charleston, Horry county, Georgetown county, and Berkeley county. These regions included rural, suburban, and urban populations, and contained communities from across the socioeconomic spectrum. Interviewees had a range of job descriptions and duties, including water testing, running informational booths at events. This wide spectrum of roles reflected different levels of public interaction and produced a range of insights and opinions. Initial interviews were conducted with members of Carolina Clear's Regional Stormwater Consortia. Snowball sampling was then used to identify a larger pool of interviewees. This purposive sampling resulted in an uneven geographic distribution of stormwater managers due to the size of smaller towns and their inability to support a dedicated stormwater manager. Issues of distrust prevented interviews with a small number of local stakeholders. Private sewer companies were invited to participate but did not respond to queries. There was some overlap in geographic jurisdictions, as managers from both a town, city, and county level were interviewed.

Interviews were semi-structured. All stormwater managers were asked a set series of questions but were prompted with follow up questions to clarify information when necessary. Managers were asked about basic information such as job duties and demographic information about their communities. This information was supplemented with data from the US census to determine population density, number of renters, poverty level, change in population, and other factors that could relate to water quality⁶⁸. Managers were then asked about perceived barriers to septic system maintenance within their community, as well as factors that influence proactive homeowners. There were also questions on how knowledgeable homeowners were on various maintenance actions that were included as these actions relate to the knowledge of action strategies variable in the Hines Model⁶⁹. Stormwater managers were encouraged to provide their

opinions, even if there was not statistical information available. Several interviews were conducted with multiple professionals at the same time. Interview times ranged from 20 to 90 minutes. These interviews were audio recorded, transcribed, and anonymized before being analyzed. A complete list of questions is available in Appendix 1.

3.2 Analysis Methods

The researcher used qualitative constant conduct analysis⁷⁰ to analyze data. Different quotations from transcript were sorted based on their contents into different groups, called codes. For example, information on where the stormwater manager worked was sorted into the location code. Codes were used to gather all alike information together for analysis. Codes were grouped into larger themes based on how they would be used to inform the campaign. Information that was coded as location was part of the context theme, because this information provided background for the campaign. Some codes were identified a priori using interview memos and behavioral models. Others were created post priori using iterative coding sessions. NVivo software was used to streamline the coding process; anonymized transcripts were uploaded to the program, as were predefined codes and themes. The researcher identified quotations from interviews that were relevant to the project and sorted them into codes⁷¹. They were then able to search by code or theme to view all quotations that contained that type of information. This was used to compare information across regions in order to draw conclusions on commonalities between communities that could inform the communications campaign. A summary of the codebook can be seen in the results section of this paper, and the full codebook is available in Appendix 2.

4. Results

The codebook was subdivided into nine themes. Codes are grouped into by the category of information they provide. A summary of themes can be seen in Table 1, and the full codebook is available in Appendix 2. The first theme involves situational *context*, and includes information on geographic area, demographics, and the current job responsibilities of a stormwater manager. Information from this section was assessed to determine the background of each region and provide context to later answers. The second theme was about *barriers* to septic system maintenance. Using the Hines Behavioral Model as a starting point, different types of barriers were pre-identified and assigned a short code. Some codes were further divided into sub-codes to provide a higher level of detail on specific issues. Similarly, the third theme of the codebook contained language relating as to why homeowner would maintain their septic system. This section, termed by researcher as *action indicator*, was included in order to analyze internal reasoning of proactive septic system owners that could in turn inform the eventual campaign.

Table 1: Summary of the codebook based on larger themes.

Theme	Definition	Example Code	Example Quote
Context	Background information about the community including demographics and geographic location.	Location Community Socioeconomic Level Population Density	<i>“We have a large population of renters, and I don’t think that they understand the type of system they’re connected to.”</i>
Barriers	Reasons why homeowners would not maintain their septic systems.	Knowledge Barriers Procedural Barriers Financial Barriers Temporal Barriers	<i>“I think that some people that have septic tank systems probably don’t have the couple hundred bucks it would take to pump out your system or hire somebody to inspect it.”</i>
Action Indicators	Reasons given why homeowners do maintain their septic system.	Residence Upkeep Personal Responsibility Recreation Community Pressure	<i>“They’ve had a [failed septic system] and they’ve endured a significant cost. So they’re trying, they’re risk aversion is to not get that cost again.”</i>
Communication	Both current and desired messages and methods of communication with homeowners about septic systems.	No Previous Communication Current Messaging Desired Messaging Current Methods Desired Methods	<i>“We have fact sheets and flyers on maintaining their [septic] system.”</i>
Actions	Behavior homeowners can engage in to maintain their septic system.	Periodic Repetitive	<i>“Not putting certain things [into your septic system]. You know, not driving on top of your septic tank system, drainage field, or planting on top of it...”</i>

The most detailed segment of the codebook was the theme of *communications*. It was divided into *current communication* and *desired communication* in order to differentiate between the current state of septic system communication, and strategies that stormwater managers desire to employ. It also included codes to identify the type of messages and methods that were used. The researcher defined messages as the content of the communication, such as the language used or the type of appeal. Methods were the delivery method of the message; posters, billboards, mailing, etc. Both the message and method of communication are important considerations in a communications campaign.

The codes associate with the *actions* theme of the codebook were used to identify actions that stormwater managers recommended homeowners take to maintain their systems. This included lower effort actions such as avoiding parking cars on drain fields, to time consuming activities including professional servicing.

In order to summarize the action indicators and barriers that were most frequently found within the communities represented by the interviews, the researcher created a matrix that indicated if a barrier had been mentioned in relation to a specific demographic group (Table 2). Demographic groups were manager-identified, as were the barriers and action indicators. A matrix square was checked if a manager mentioned a barrier or action indicator specifically relevant to a socioeconomic group. It should be noted that just because a certain intersection of barrier or action indication and demographic was not identified in this matrix, it does not mean that that group does not face that barrier. It only means that the stormwater managers interviewed did not specify them.

Table 2: A matrix showing intersections of demographic information with barriers and action indicators of septic system maintenance.

	Socio-Economic Level				Population Density			Other		
	Affluent	Middle Class	Low Income	Rural	Suburban	Urban	Renters	Minority	Short-term	
Barriers	Knowledge	Basic								
		Procedural	X	X	X	X	X	X	X	
		Ecological		X			X			
		Health			X					
	Financial	Recreation	X				X			
		Busy Homeowner	X	X	X	X	X	X	X	
		Irregularity		X	X		X			
	Temporal		X							
	Wary of Authority			X	X			X		
	Language	Previous disaster	X		X	X			X	
Lesser Expense		X	X	X	X	X		X		
Residence Upkeep		X	X	X		X				
Recreational						X				
Financial AI	Family Health		X			X				
	Ecological Upkeep									
Action Indicators	Personal Responsibility	X				X				
	Community Pressure	X	X		X	X				
	Prev. Septic Experience	X	X		X	X	X	X		
		X	X	X	X	X	X	X		

4.1 Barriers

Procedural knowledge was the most common knowledge barrier between all of the demographics. The researcher defined *procedural knowledge* as actions that homeowners need to take to maintain their septic system. This includes daily actions such as not putting fats, oils, and grease down the drain, to less regular acts such as getting a system professionally inspected and pumped. Septic system managers who were interviewed believed that people from all almost all demographics were poorly informed on proper procedures.

Other knowledge barriers tended to be found in subsets of the community. *Basic knowledge* was lacking in middle income, low income, and rural populations, and was especially high among renters. *Basic knowledge* was used to code for knowledge such as knowing if a household was using septic systems, or if septic systems need to be maintained. Interviewees said that a few homeowners were unaware that their house used a septic system and were therefore taking no steps to preserve their septic systems.

Financial barriers were brought up by all of the stormwater managers, regardless of the socioeconomic status of their region. One stormwater manager said that even affluent homeowners can face cost-prohibitive issues, as it can cost “around \$20,000, sometimes up to \$50,000”, for homeowners to replace failing systems. It was pointed out by the same stormwater manager that cost can increase if the home is on the water, as soil saturation could make it difficult to find suitable locations for drain fields. And often these waterfront properties are owned by wealthier families. However, when it comes to septic system maintenance such as inspections and pumping, which can cost anywhere from \$200 to \$700 dollars, it is especially difficult for lower-income people to afford. Since this expense is irregular in that it only comes up once every three to five years, it can be difficult for people to budget for such an expenditure.

Temporal barriers were brought up in relation to all groups except affluent homeowners. Stormwater managers told researchers that in their experience, homeowners forget to get their systems inspected or pumped because it is an irregular action that they simply do not think about. The quote “out of sight, out of mind” was repeated by managers. Several managers also mentioned that some people were aware that they needed to get their system inspected, but could not take time off of work to show an inspector around.

Several stormwater managers based in southern SC said they were encountering people who did not speak English when conducting outreach. This is backed up by data from the US Census, which shows 12-20% of households in these areas speak a language other than English⁷². However, managers said this mostly applied to rural populations, renters, or minorities.

One barrier that was added to the codebook as interviews were being transcribed was the *Wary of Authority* code. This code was used when stormwater managers brought up the fact that some homeowners were not receptive to outreach because they had concerns about government overreach. Specifically, they expressed concern that if it was found that their septic systems were leaking, they would be fined and made to pay for repairs. For this reason, homeowners were unwilling to speak with officials. This code came up with both urban and rural populations, as well as middle- and low-income demographics.

4.2 Action Indicators

Action indicators were characteristics or beliefs that stormwater managers believed were common among people who currently take action to maintain their septic systems. In other words, why do people who currently maintain their septic system do so. The researcher was interested to see if there were any commonalities that could be used to inform the messaging of the communications campaign, their reasoning being if a certain piece of knowledge or attitude motivated one individual to maintain their septic system, it motivate another to do the same.

There were two consistent action indicators between demographics; *previous septic system experience*, and *previous financial disasters*. Stormwater managers said that people who grew up or had lived in homes with septic systems prior to their current residence, and had *previous septic experience*, were more likely to take preventative actions. Alternatively, if homeowners had only been on septic for a short period of time but had been forced to pay the financial aftermath of a failing system, they were likewise likely to spend time and money to keep a system in working order to avoid a future disaster (*previous financial disaster*). It should be noted that according to interviewees, it was the financial outcome that drove future preventative behavior, not potential environmental effects.

Other prevalent action indicators were *residence upkeep* and *recreation*. Stormwater managers said some homeowners viewed septic system maintenance as a part of home ownership and treated it similar to other aspects of *residence upkeep*. This was primarily in suburban and high- and middle-income communities. Managers also believed that people who engage in waterfront *recreation* such as fishing, boating, or oystering as likely to take care of their septic system because the negative consequences of septic failure could affect their activities.

4.3 Actions

The *actions* that stormwater managers recommended that people take were consistent throughout the interviews. All of them stressed the importance of regular inspections and pump outs, the lack of which many thought was the cause of current fecal contamination concerns. Managers also spoke about disposing of fats, oils, and grease in a can and not putting them down the drain, parking away from the drain field, and conscience water use so as to not overburden the septic tank. There were also several actions that were sharply discouraged, as

they were damaging to the infrastructure or chemical balance of the system. Managers spoke of a recent increase in the use of so-called flushable wipes, which can clog pipes and fill tanks. Chemical products such as Rid-X that were marketed as promoting septic health were also brought up, as these products are in fact damaging to the enzymes that break down solid waste in the septic tank, and as such can cause issues over time.

The researcher divided recommended actions into two categories; *repetitive actions*, which are changes in everyday behavior, and *periodic actions*, which are actions that should take place once every several years. See Table 3 for examples. These two distinct types of action offer different options for communication campaigns.

Table 3: Repetitive vs. Periodic actions for septic system maintenance.

Repetitive Action	Periodic Action
Parking away from drain field	Septic system inspection
Conscientious water use	Septic system pump-out
Not putting fats, oils, and grease down the drain	
Avoiding harmful additives	

4.4 Communication

Almost all of the stormwater managers interviewed provided a basic level of septic system education to homeowners. Several managers said their communications was mostly *reactive*, and they would only reach out to homeowners after a suspected failing septic system was identified. A minority took *preventative* action such as reaching out to the public to teach appropriate behavior. Managers said this was due to a lack of time, resources, or responsibility on their part; several towns had private sewer systems that handled waste disposal and should in theory have been responsible for septic upkeep¹.

There were few overarching themes within successful or unsuccessful communication methods. The few managers who received federal grants to update community septic systems launched in-depth initiatives that included multiple workshops, community meetings, and outreach components. Based on information gathered in interviews, these initiatives were by far the most successful type of outreach. Other successful methods mentioned were largely based on interpersonal communication, where people would hear about a program when they talked to their friend or neighbor.

¹ It should be noted that attempts to set up interviews with private sewer companies were unsuccessful.

4.4.1 Current Communication Messaging

Current messaging is overwhelmingly *positive* in tone. Many managers mentioned the “carrot versus the stick”, and said they preferred the carrot. They believed that positive messaging would be more effective than *negative* messaging. Several expressed discomfort with the idea of using threats of fines or other penalties to encourage behavior change, and said they thought it would ultimately lead to low compliance. Some of the stormwater managers that were interviewed discussed their water sampling methods and results with homeowners using technical language and charts.

A wide range of messages were used to encourage behavior change. The majority of messaging was educational in some way, with information on *health* risks and *ecological effects*. Stormwater managers were knowledgeable on the subject of septic systems and could communicate about this issue when speaking to homeowners in person. *In-person events*, such as booths set up at festivals, often had hands-on educational games where attendees could ‘sort’ food by if it should go in the trash or in the garbage disposal.

There was not a lot of mass media (television PSAs, radio spots, billboards, etc) mentioned on septic systems. One manager who had received a grant to replace failing systems spoke about signage that had been put up upon completion of the grant to inform residents about the successful results. This was the extent of media discussed in the interviews. However, most managers did have a flyer, coded as *print media*, distributed by Carolina Clear on hand. The flyer explained how a septic system functions, and included a few sentences on the health, ecological, and economic effects of leaking systems. It also had information on how to take care of a septic system, informing homeowners that they should have their system inspected and pumped, reduce the amount of grease that they put down their sink, avoid parking on their drain field, and stagger the use of water-intensive utilities. There was also a section on what homeowners should not put down the drain. Finally, there was one sentence on the *financial* benefits of preventative maintenance preventing costly system failure.

4.4.2 Current Communication Methods

Since Carolina Clear distributed printed materials to all of their Consortium members, this was the most common type of communication mentioned by stormwater managers. These double-sided, half-page cardstock flyers had some photographs and diagrams, but of the flyer was taken up with writing and information. At least three different fonts were present. Other common methods include community workshops and/or meetings, as well as door to door communication with homeowners that are suspected to have failing systems.

Interviewees reported different success rates, even when using similar outreach methods. One interviewee said that *workshop* success depended on the population they were targeting, with rural communities less likely to attend workshops than urban ones. Another said that those who

attend workshops are usually homeowners who are already aware of septic system issues and are not the people who really need the information. This observation is supported by scientific literature, which found that attitude is a strong predictor of workshop attendance⁷³. Other managers reported that workshops were effective outreach methods that resulted in attendees learning a great deal about septic maintenance, with the caveat that their workshops were mandatory in order to receive financial assistance for system repair. Additionally, there was a universal lack of follow up after workshops, so it is difficult to judge whether the workshops resulted in action. Studies on behavior change have indicated that workshops might be effective for changing thought processes but have little effect on behavior⁷⁴.

The most common types of outreach beyond printed materials was *face-to-face* communication. A majority of groundwater managers did not perform regular outreach on appropriate septic system behavior. Instead, they primarily focused on leaking systems. In this case the stormwater manager would interact primarily with homeowners upon detection of a possible septic issue. They would visit the homes in person to talk with people and conduct additional tests. Some managers faced difficulty engaging with homeowners, as these people worried that if further testing revealed leaks it would lead to fines.

Most stormwater managers with experience with *mass mailers* said they were largely ineffective due to the large amount of junk mail that homeowners experience. This is consistent with similar studies on informative mailers, which found a response rate between .5 and 4.1%⁷⁵. Some managers mentioned that one-time communication such as brochures, forms, or workshops without follow-up did not encourage behavior change, because people simply forgot what they were directed to do.

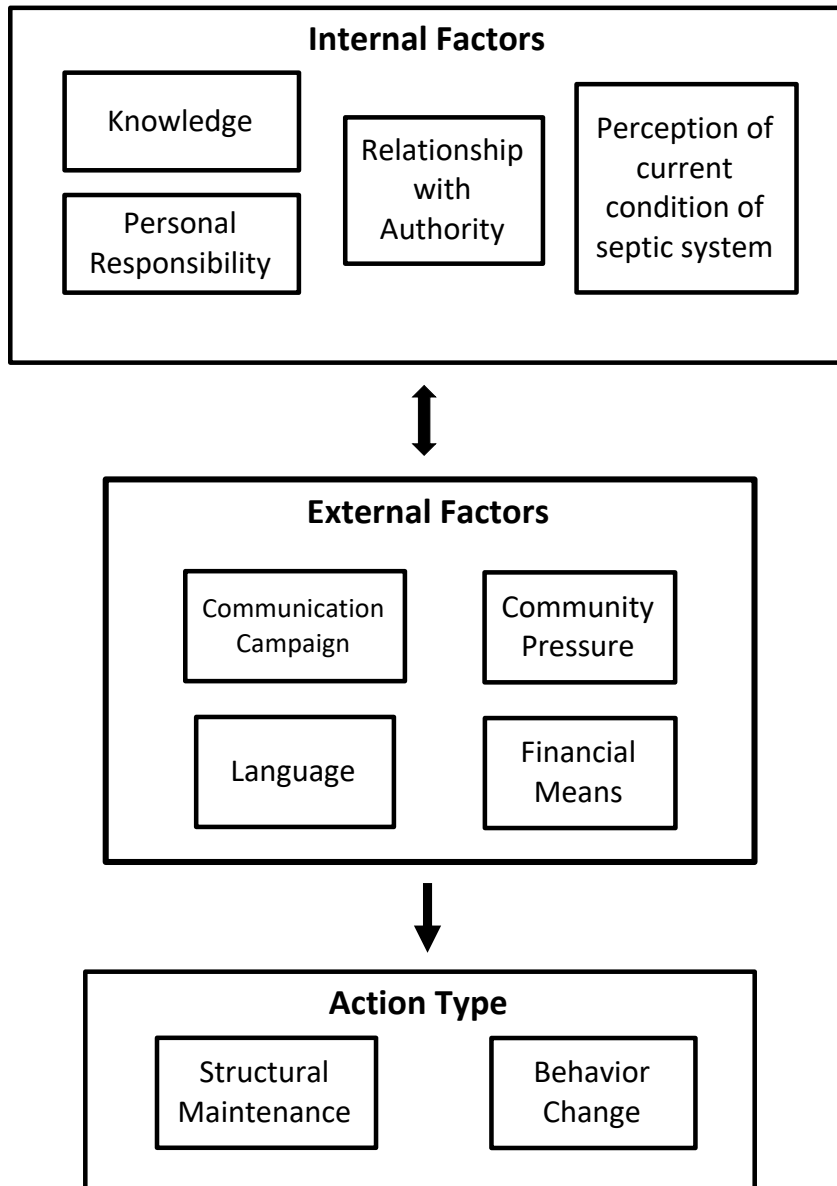
5. Discussion

The goal of this project is to deliver an effective communications campaign to encourage homeowners to engage in septic maintenance. The researcher therefore wanted to understand why homeowners act the way they do when it comes to septic maintenance. They constructed a prescriptive decision-making model⁷⁶ to explore the reasoning behind septic action or inaction and identify potential gaps in homeowner knowledge. The insights gained from the model were then used to craft campaign messages that addressed these gaps in order to influence homeowners who do not currently engage in septic upkeep to change their behavior⁷⁷.

The decision-making model was created using results from the interviews in order to inform the communications campaign (Figure 3). Different factors that homeowners consider when deciding whether to maintain their septic systems were included and divided them into two categories; *Internal* and *External*. *Internal* factors depend on a homeowner's thoughts and feelings; these factors include *relationships with authority*, *perception of current condition of septic system*, *personal responsibility*, and *knowledge*. It is important to note that the arrow

between internal and external factors is double headed; all of factors influence and effect each other, and all contribute to any action that is eventually taken.

Figure 3: A decision making model on septic systems.



Several of these factors correspond to previous models. The *personal responsibility* component is similar to the ascription of responsibility factor of the NAM⁷⁸, but the researcher includes two types of responsibility; responsibility to the community⁷⁹ and responsibility as a homeowner. Some individuals might feel responsible to do their part to protect the larger community in the form of keeping waterways clean and protecting the health of the ecosystem⁸⁰. Others may feel

they are responsible as homeowners to maintain their septic system. This was seen when interviewing stormwater managers, as several said that homeowners who currently maintain their septic system view it as part of regular home upkeep. A working septic system is an important part of general home maintenance; therefore a homeowner might view continued maintenance as part of their legal or ethical obligations as property owners^{81,82}. The communication campaign can target this component of the decision-making model by reminding homeowners that they are responsible for both their personal home and their larger community.

The *Knowledge* component encompasses *procedural knowledge* such as what steps to take to maintain a septic system, as well as knowledge of ecological, recreational, and health consequences of system failure. In this way it contains elements of the *cognitive variables* of the Hines model⁸³ and the *awareness of consequences* variable of NAM⁸⁴. Research has shown that an awareness of consequences must come prior to other interventions in order to effectively facilitate behavior change⁸⁵. The communications campaign can influence the knowledge component of the decision-making model by including information on the various consequences of septic failure as well as proper procedures that homeowners can follow to maintain their system.

The *perception of current condition of septic system* component of the decision-making model how a homeowner views their own septic system. Several stormwater managers stated that in their experience, homeowners who believe that the septic system is working properly are less likely to take preventative action⁸⁶, especially periodic action such as inspections. This factor relates to *temporal barriers*; the ‘out of sight, out of mind’ refrain that came up multiple times during interviews⁸⁷. If a septic system is working properly, it is often forgotten about or given lower priority than other household needs. It is only when homeowners perceive an issue that they take steps to maintain the system. In this way, the *perception of current condition of septic system* component is influenced by the *knowledge* component of the decision-making model. The communication campaign should therefore include language on negative consequences of septic failure that can go unseen by homeowners, such as ecological or health effects.

The *relationship with authority* component is unique in this model, as it relates to an individual’s larger worldview and is not often specified in behavioral models. This component encompasses a homeowner’s attitudes on the government or other authority figures. Many of the stormwater managers are government officials, and some individuals are distrustful of the government⁸⁸. In the case of septic systems, fines can be leveled if a system is leaking contaminants into ground water⁸⁹. Several stormwater managers said that there were occasions when they tried to talk to homeowners about leaking septic systems, and the homeowners were uneasy around them and difficult to engage with. The managers believed that this was possibly because the homeowners mistrusted the authorities and feared that monetary fines would be

imposed if they were honest about their current septic system situation. The *relationship with authority* factor is mostly relevant in cases where stormwater managers conducting routine testing identify a failing system and approach homeowners to find a way to solve the issue. Since the communications campaign will not include interpersonal communication, this factor is not incredibly relevant to recommendations. The one takeaway that could be useful would be to avoid mentioning monetary fines in campaign material.

Moving onto the other category of behavioral influences, *external* components depend on a homeowner's interactions with entities outside of the house. Unlike *internal* components, which depend on an individual's beliefs about septic systems, *external* components largely depended on outer influences such as an individual's job, community, and media consumption. To be clear, these two groups of components influence each other greatly. But for the purpose of this communication campaign, they were by how lessons learned about the components would influence the campaign. In general, *internal* components effect the type of information that the communication campaign presents (i.e. information on consequences, proper maintenance steps), while *external* components influence how the information is shown (i.e. using aligned norms or different languages).

The *community pressure* component relates to social norms, specifically descriptive norms. Even if the injunctive norm is to maintain a septic system, the actual attitudes of neighbors, or the descriptive norm, would have a larger influence on ultimate behavior^{90,91}. If septic maintenance is uncommon within a neighborhood, it contributes towards what the homeowner views as 'normal' behavior. The communications campaign can address the effects of community pressure by showing aligned descriptive and injunctive norms on materials. Specifically, septic system upkeep should be framed as common behavior. This can be done by showing homeowners engaging in septic maintenance and the positive impacts that result, instead of focusing on septic systems that have failed due to negligent behavior and how homeowners are suffering the consequences.

The *language* component of the decision-making model is based primarily on the language barrier mentioned by stormwater managers. It is an essential aspect of accessible information. Despite the fact that this issue as not brought up as frequently as others, the stormwater managers who talked about it viewed it as a major obstacle, especially because they believed that in rural areas, those with septic systems were more likely to speak different languages due to lower costs of living. This is supported by research that shows racial minorities are more likely to face septic system failure⁹². This potential barrier can be overcome if print or web-based information is made available in various languages.

Financial means was one of the most influential in relation to septic maintenance. This is especially true for periodic actions. Homeowners might be knowledgeable on septic system

upkeep practices, but if they do not have the money for inspections or pump outs there is little chance that these actions will take place. While there are federal grants that can be used to offset costs of septic repair⁹³, they are only available at a municipal level, so individual homeowners are ineligible. Given that providing financial assistance is beyond the scope of this project, the communications campaign will therefore focus on low-cost repetitive actions in order to motivate action that is not predicated on finances.

The *communications campaign* component is the focus of this paper. Given the multi-directional relationships of the components of the decision-model, the campaign will influence the other components using targeted language to address identified barriers.

5.1 Recommendations on Messaging

Much of the messaging should be based around the *knowledge* component of the decision-making model, which encompasses both procedural and consequential information. Stormwater managers believed that homeowners were unaware of both consequences of failing septic, and what actions to take to prevent future issues. Furthermore, studies on behavior have shown that actors who are cognizant of the effects of their actions are more likely to engage in behavior change⁹⁴. Data on recreational impacts such as beach closing⁹⁵, health impacts⁹⁶, and ecological impacts⁹⁷ of septic leakage should be included in messaging. Providing messaging that has information on all of these impacts should ensure that homeowners are aware of the diverse consequences of septic inaction.

The campaign can also target a lack homeowners' lack of procedural knowledge, or steps of septic upkeep, as identified by stormwater managers. In Table 2, this was represented by the aforementioned *procedural knowledge barriers*. One of the action indicators, *previous septic experience*, could be seen as a foil to a lack of knowledge, as a person with previous septic experience could have more knowledge on septic system maintenance than a person with no experience. Current outreach materials used by Carolina Clear often focuses on costly periodic actions such as official inspections and pump outs (Table 3). As this campaign does not have a financial assistance component, it would be more effective to concentrate messaging on everyday repetitive actions that are less expensive, especially because costs of a failed system are much greater than preventative costs⁹⁸. By focusing on septic maintenance procedures that have lower financial implications, the campaign has a greater chance of reaching a wide range of septic system homeowners, including those who face economic constraints that would discourage them from pursuing high-cost periodic actions.

In addition to showing low-cost septic maintenance actions in the campaign, there should be more information on financial consequences of failing septic systems. Homeowners who are unaware of these consequences could be less motivated to change their behavior than those who are aware of them⁹⁹. This was seen during interviews, when stormwater managers mentioned

previous financial disasters as an action indicator as seen in Table 2. Homeowners who experienced septic failure before and had to pay thousands of dollars to replace a system were likely to maintain their current system in order to avoid repeated financial loss¹⁰⁰. Communicating the financial impacts of poorly maintained septic system could allow the campaign to engage risk-averse individuals who want to lower the chance of monetary damages¹⁰¹.

Messaging should also be influenced by other components of the decision-making model. Homeowners should be informed that their current *perception of the condition of their septic system* might be skewed, as systems can leak harmful fecal coliform without complete system failure that would be seen in the house and are usually only identified using water tests¹⁰². And even if a system is working properly now, they should still take action to ensure it continues to run smoothly. Meanwhile, portraying septic maintenance as a part of home ownership engages the *personal responsibility* component by encouraging homeowners to view their septic maintenance as a part of their homeowner responsibilities in addition to its role in community health¹⁰³.

Community pressure can be leveraged using social norms to inform the language used within the communications campaign. If a homeowner believes that their neighbors are practicing a promoted pro-environmental action, they are more likely engage in the behavior themselves¹⁰⁴. Descriptive norms of the community should be shown as aligned with injunctive norms; proactive septic maintenance should be presented as a normal part of home ownership¹⁰⁵.

6. Conclusion

Septic system maintenance is an important aspect of public health, especially in times of aging infrastructure and rising sea levels. Clemson Extension's Carolina Clear is working to improve water quality in South Carolina, and desires to focus on improved septic system health through homeowner behavior change. Using information gathered from interviews with stormwater managers, the researcher proposed a rudimentary decision-making model on septic system maintenance. This model was in turn used to generate recommendations on a future communications campaign.

Carolina Clear should focus on low-cost, repetitive actions. Homeowners across socioeconomic classes or community sizes struggle with septic system maintenance. Preventative, routine actions such as avoiding putting greases and fat down the drain can appeal to homeowners regardless of background and could therefore reach a large audience. Along with actions, information on health and ecological impacts of failing septic as well as potential financial consequences should be included in messaging¹⁰⁶. Language in the campaign should be carefully phrased so that injunctive and descriptive norms are in alignment to encourage positive behavior change¹⁰⁷. Coastal South Carolina is home to diverse communities and

cultures, and the communication campaign should be accessible to any homeowner who desires to take care of their septic system and prevent negative septic outcomes.

Appendix 1 – Septic Interview Questions

1. In which area(s) of South Carolina do you work?
2. Can you give a description of your job responsibilities in relation to septic system issues?
3. What are the key actions homeowners need to take to maintain their septic systems?
4. Can you tell me about the community that you serve? Is it rural or urban?
5. How many people live in your community, and about what percentage of people have septic systems in your area?
6. Overall, how well informed do you think your community is about septic system maintenance?
7. Do homeowners in your community know how often to have their septic system inspected and pumped?
8. As a follow up, how many people do you think take action to properly maintain their septic system?
9. In your experience, what are some of the most common reasons that homeowners provide for not regularly inspecting and pumping their septic system?
10. When you speak to people who do maintain their septic systems, what reasons do they give for these actions?
11. Are there specific demographic or socio-economic groups in your community that are more informed about septic system maintenance?
12. On the other hand, which demographic or socioeconomic groups do you have challenge reaching?
13. Are you currently doing any outreach on septic systems? If so, what methods are you using?
14. In your experience, which methods are most effective at encouraging people within your community to take action to maintain their septic systems?
15. As a follow up, were there any methods that were clearly unsuccessful in encouraging people to take action?
16. Are there any strategies to encourage people to take action to maintain their septic system that you are aware of but have not been able to utilize, or that you wish the state would implement?

Appendix 2 – Complete NVivo Codebook

Name	Description
1.000 Context	Background information on these stormwater managers + their practices
1.100 Location	What areas are under the jurisdiction of these stormwater managers?
1.200 Biological Data Collection	How are they collecting data on water contamination?
1.210 Field Visits	Stormwater managers visit septic systems to do a visual check as well as a smell check.
1.220 Water Sampling	How water samples are collected and analysed.
1.300 Community	
1.310 Socio-Economic Class	What socio-economic class the community falls into
1.311 Affluent	The community is relatively affluent.
1.32 Middle Class	The community is mostly middle-class.
1.33 Low Income	Communities with low income.
1.320 Population Density	How dense the population is in the community.
1.321 Urban	The stormwater manager identifies the community as urban.
1.322 Suburban	The stormwater manager identifies the community as suburban.
1.323 Rural	The stormwater manager identifies the community as rural.
1.330 Age	Age range of residents
1.340 Minority	Racial or cultural minorities.
1.350 Renters	People who rent property they live in.
1.360 Short Term Residents	Residents who will only live in their property for a short amount of time. This could include military families or young adults who move frequently.
2.000 Barriers	
2.100 Knowledge Barriers (KB)	knowledge deficits
2.110 Basic System KB	Homeowner is not aware that they have a septic system, where the drainfield is, etc.
2.120 Procedural KB	Homeowner does not know how to maintain system (when to pump, not to flush FOGS, etc)
2.130 Ecological KB	Homeowner does not know about the ecological effects of a leaking system. Includes Awareness of Consequences
2.140 Recreational KB	Homeowners do not know about recreational effects of a leaking system.
2.200 Financial barriers	Homeowners cannot afford to get a system inspected/pumped.
2.300 Language	Homeowners do not understand educational literature because they do not speak/read English.
2.400 Temporal Barrier	Barriers related to time constraints
2.410 Busy Homeowner	Homeowners know they have to get their system inspected, cannot take time off.
2.420 Irregularity	Since a system is inspected once ever 3-5 years, homeowners do it once and then simply forget.
2.500 Wary of Authority	If people don't like who is telling them about the issue, they don't want to take action.

Name	Description
3.000 Action Indicators (AI)	What prompts homeowners to take action to maintain their systems.
3.100 Personal Responsibility	Homeowners feels septic maintenance is the responsible thing to do.
3.110 Residence Upkeep	Homeowners believe that septic maintenance is a part of home ownership.
3.120 Recreational	Homeowner is aware of the impacts of system failure on recreational activities.
3.130 Family Health	Homeowners want to protect their family from potential health hazards of a failing system.
3.200 Community Pressure	Homeowner feels pressure from the community to maintain standards.
3.300 Financial AI	There are financial motives to maintain septic.
3.310 Lesser Expense	Homeowner is aware of the cost of system failure and wished to avoid it.
3.320 Previous Disaster	Homeowner previously experienced a system failure and do not want to experience it again.
3.400 Storm Preparedness	People pump their systems before a storm.
3.500 Prev. Septic Experience	Homeowners who grew up with a septic system or had previous experience with one.
3.600 Urban Areas	People in urban areas maintain their systems.
4.000 Target Audience	Who should we target for the communications campaign?
4.100 Current Actors	What are some characteristics of those who already takes action to maintain their septic system?
4.200 Desired actors (DA)	What are some characteristics of those who already takes action to maintain their septic system?
4.210 Generalized DA	Wide-ranging demographics of people who
4.220 Specific DA	Specifically mentioned smaller groups that could be targeted
5.000 Communication	
5.100 No Previous Communication	There has never been communication about septic systems
5.200 Current Communication	What methods have been used to reach homeowners?
5.210 Communication Messages	What kind of language is used to communicate with septic system owners?
5.211 Educational	Factual information is presented
5.211a Ecological Facts	Campaigns include information on the ecological effects of a failing system.
5.211b Recreational Facts	Educational campaigns include information on the effects on fishing, swimming, or oyster hunting that a failing system has.
5.211c Other Educational Messages	Educational campaigns include other types of information that is not otherwise classified.
5.212 Methods	Message explains methods to take on how to maintain system
5.212a Maintenance	Messages include inspection and pumping
5.212b Preventative	Messages include actions like no FOGS, don't park on drainfield, etc
5.213 Emotional Appeals	This is when a message includes information on historical or cultural aspects of waterfronts.
5.214 Impact Information	Message explains health/ecological if failing septic system is not fixed.

Name	Description
5.215 Positive	
5.216 Threatening	Message threatens fine if failing septic system is not fixed.
5.220 Communication Methods	What methods have been used to reach homeowners?
5.220a Community Liaison	A community member acts as an intermediary to spread information.
5.220b Community Meeting	A gathering of homeowners and stakeholders to discuss septic issues
5.220c Door to Door	Stormwater managers went door to door in the community to talk with homeowners with leaking systems
5.220d Event booths	Stormwater managers set up booths at events and speak with interested event goers
5.220e Event Facilitation	Stormwater managers plan events to encourage water maintenance *NOT NESSECARILY SEPTIC FOCUSED
5.220f Hotline	People can call a hotline to ask questions or report leaks.
5.220g Official Mail	Mail is sent to homeowners telling about potential leakage of their system.
5.220h Printed Material	Homeowners who inquire about septic systems are given printed information sheets and brochures
5.220i Signage	Billboards/other signage is used to communicate septic messages.
5.220j Website	People can access information through a website or report violations.
5.221 Successful Comm Methods	Methods that are successful.
5.222 Unsuccessful Comm Methods	Methods that are unsuccessful.
5.300 Desired Communication	What do stormwater managers want to see enacted?
5.310 Desired Messages	Messages the stormwater manager desires to use in the future.
5.320 Desired Methods	Methods the stormwater manager desires to use in the future.
5.400 Messaging stage	At what point stormwater managers try to reach homeowners. (ie before or after a leak has occurred)
5.410 Preventative	Communication that takes place before a leakage has been found in order to prevent said leakage.
5.420 Reactive	communication that takes place after contaminated water has been found
6.000 Actions	What do homeowners need to do to maintain their septic systems?
6.100 Periodic	Actions that happen every few years, such as inspections or pumping.
6.200 Repetitive	These are actions that homeowners do everyday to maintain their septic systems
7.000 Effects	What are the effects of a leaking system?
8.000 Misc. Solutions	Solutions not involving communication, such as laws or grants.
9.000 Future	Desires stormwater managers have for future communication on septic systems in their communities.

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