

IS STORMWATER TREATED? A SURVEY OF AWARENESS AND BEHAVIORS THAT MAY IMPACT NONPOINT SOURCE EDUCATION

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Abstract. In an effort to collect information on public perception, knowledge, behaviors and willingness to get involved in improved stormwater management, a telephone survey of South Carolina residents in targeted education areas was implemented in 2009. Results of the survey have identified target behaviors and awareness, adding focus to ongoing stormwater education efforts and establishing a baseline for measuring successes that may be attributed to these current and future efforts. This manuscript presents the results of this survey and offers some insight on stakeholders' attitudes, knowledge and behaviors related to watershed and stormwater, critical factors in the initial development of effective stormwater education and public involvement programs.

INTRODUCTION

As stated by Costanzo et al. (1986), "behavior change is the only goal of consequence." This is as true for watershed education as it is for other sustainability outreach efforts. Clemson University's Carolina Clear program is implementing regional stormwater education and involvement programs in more than three dozen communities across South Carolina. These municipal/county and university partnerships have been spurred by the National Pollutant Discharge Elimination System (NPDES) Small Municipal Separate Storm Sewer Systems (MS4) General Permit, effective in South Carolina in March 2006.

The US Environmental Protection Agency (US EPA) recommends language for permit writers of the next phase of the NPDES MS4 permit in the 2010 publication entitled, *MS4 Permit Improvement Guide*. Permit language recommended by the EPA asks the permittee to assess changes in public awareness and behavior resulting from the implementation of public education

and involvement measures. A voluminous body of research has investigated relationships between environmental attitudes and behaviors, with researchers agreeing that knowledge can influence environmental concern (Kaltenborn, 1998; Thompson, 2004), and that both knowledge and concern are important antecedents for engaging in environmentally-friendly behaviors (Tarrant et al., 1997; Hines et al. 1986/1987; Bamberg and Moser, 2007). In the context of stormwater education, there is a need to improve understanding of how residents' attitudes shape their behaviors, especially as a number of these behaviors can contribute to nonpoint source pollution. Nonpoint source pollution has been identified as one of the most significant threats to water quality (Sleavin and Civco, 2000). It is the hope of the authors that this manuscript presents data helpful in understanding society's attitudes, knowledge and behaviors related to watersheds and stormwater, critical factors in the development and implementation of effective stormwater education and public involvement programs.

PURPOSE

In the summer and fall of 2009, a telephone survey of residents (n=1,599) from four regions of South Carolina was conducted through the Department of Sociology at Clemson University. The four regions include two coastal (urban areas surrounding Myrtle Beach and Charleston) and two inland (urban areas surrounding Columbia and Sumter and, separately, Florence). Responses from Columbia and Sumter were combined in this survey effort so that results could be summarized as representing the "Midlands" of South Carolina, a common reference to the geographic center of the state.

The primary purpose of the survey was to obtain information about residents’ attitudes, knowledge, behaviors and intentions as they relate to watershed issues. Through multiple partner efforts, these four regions have been exposed to one to four years of targeted watershed and stormwater education including presence at community festivals, classroom education, rain garden installations at schools, rain barrel workshops, technical training including sediment erosion control, mass media (billboards, radio and television commercials), coordinated web pages and streamside clean-ups. In this paper, we report on findings that have particular relevance for refining these educational efforts in the coming years and the educational efforts of agencies and communities working with residents of South Carolina.

METHODS

The survey was conducted using Computer Assisted Telephone Interviewing (CATI) software. Random lists of phone numbers based on target zip codes were purchased from a reputable national vendor of telephone samples. The majority of calls were made during evening hours, weekdays between 5:00pm and 9:00pm. Limited daytime and weekend calling was also conducted in order to include other potential respondents. The respondent needed to be a resident of one of the 23 targeted zip codes to participate in the survey. The full survey and results are available online at www.clemson.edu/carolinaclear and upon request.

Survey questions were organized into the following categories: 1) environmental concern; 2) environmental knowledge about concepts and practices and the causes of pollution; 3) participation in recreational activities; 4) participation in environmentally positive and negative behaviors; 5) willingness to get involved in efforts to improve water quality; and 6) familiarity with ongoing targeted stormwater and watershed education efforts.

To better reflect the demographic characteristics of residents in the surveyed areas, the data for each region were adjusted for demographic differences per individual region between telephone sample and 2000 US Census data by using standard statistical weighting procedures; only weighted data is presented herein.

DISCUSSION

In this paper, we report on two main findings that are particularly relevant to stormwater education: environmental knowledge and engagement in potentially negative environmental behaviors.

Stormwater Knowledge

To gauge knowledge about stormwater, respondents were provided with a basic definition of stormwater as “runoff from yards and roads during storm events or from

irrigation; it drains to ditches and storm sewers along roadways.” Following this, respondents were then asked to indicate “yes” or “no” in response to the question, “Do you believe that this stormwater is treated before reaching our lakes, streams and beaches?” Table 1 displays the responses.

Of particular interest in the context of stormwater management, a significantly higher proportion of residents from the coastal counties near Myrtle Beach selected the correct response, as compared to the inland urbanized area of Florence. Residents of Florence were also more likely to indicate “do not know” for this particular survey item. The Myrtle Beach region is the area that has had the most exposure to regional stormwater education efforts in which Carolina Clear is a participant (greater than four years); whereas, Florence is the area that has most recently been targeted for Carolina Clear’s outreach efforts (greater than one year). Without baseline data, it is difficult to assess whether this difference between the two regions is due to programmatic stormwater-related efforts. However, these results do provide a good foundation for assessing future education impacts and comparing future survey results across regions.

Watershed Knowledge

To ascertain respondents’ familiarity with basic environmental concepts, respondents were asked to select the correct definition of a watershed, “all of the land area

Table 1: Stormwater treated or untreated before discharge to waterways.

Survey Region	% Yes (Incorrect Response)	No (Correct Response)	Do not know
Coastal: Charleston n=399	18.7	77.0	4.3
Coastal: Myrtle Beach n=397	6.1	87.9	6.0
Inland: Columbia/Sumter n=402	16.0	74.1	9.9
Inland: Florence n=353	24.4	63.8	11.8

that drains to a specific river or lake." Residents of the in-land region surrounding Columbia and Sumter were most likely to select the correct response (33.1%). These results compare favorably with results of other studies. For example, in a survey of Chesapeake Bay watershed residents, nearly half (48%) of respondents chose the correct definition (McClafferty, 2002). However, in a survey of Upstate South Carolina residents, only 27.3% of respondents selected the correct answer (Mobley and Witte, 2005). This is similar to the correct response rate in Charleston (29.5%), Myrtle Beach (25.6%) and Florence (25.2%).

Participation in Environmentally Positive and Negative Behaviors

An important goal of stormwater education is to provide information to residents about the impact of their current household behaviors. This survey included a number of questions that will allow researchers, their Clemson Extension colleagues and education partners to track changes in household behaviors over time. Respondents were asked to indicate the extent to which they engaged in a variety of practices, which may or may not have intended or unintended positive or negative effects on water quality. The survey items included activities which are typically targeted in stormwater education campaigns. Table 2 provides a summary of the findings.

Taking a closer look at one of the behaviors identified in Table 2, parking lot runoff was perceived by greater

than 10% (and up to 18%) of respondents in each region as having no impact on local water quality. Yet fuel and oil leaks from automobiles were consistently perceived as having a great impact on local water quality by more than 54% of respondents in each surveyed region. This may be further testament to the misperception that stormwater is treated. This finding may also be related to research on human information processing that has indicated that people will give a disproportionate weight to “vivid” information (Borgida and Nisbett, 1977; Hamill, Wilson and Nisbett, 1980; as cited in Costanzo et al., 1986). In regard to improving the awareness that parking lot runoff consists of pollutants including those related to auto leaks, vivid imagery may be critical in ensuring that the educational message is perceived. Research has shown that citizens and decision makers are influenced by visual imagery related to environmental challenges, including endangered species (Witte, et al., 2004) and decisions related to landscape design and degradation (Mobley and Witte, 2005).

CONCLUSIONS

In the context of stormwater education and outreach campaign development, the level of knowledge, identification of target behaviors and target audiences and an understanding of motivation behind behavior change are critical considerations for success. This described survey effort was initiated to discover these elements for a specific program’s stormwater education efforts in South Carolina, but hopefully these early findings can be useful to stormwater educators in other

Table 2: Participation in environmentally positive and negative behaviors.

Survey Region	Always/nearly always considered likelihood of rain before treating a lawn with fertilizer or pesticides.	If owner of a pet, always/ nearly always picked up after the pet when on a walk.	Always/nearly always disposed of oil, paint or other chemical down storm drains.	Always/nearly always washed car on lawn or gravel instead of pavement.	Always/ nearly always dumped grass clippings or leaves down storm drains or into backyard creeks.
Coastal: Charleston	73.9 (n=171)	86.5 (n=183)	3.4 (n=387)	22.4 (n=387)	4.6 (n=375)
Coastal: Myrtle Beach	62.6 (n=171)	71.1 (n=212)	1.6 (n=388)	21.0 (n=365)	0.1 (n=378)
Inland: Columbia/ Sumter	51.9 (n=178)	67.7 (n=187)	0.8 (n=391)	21.1 (n=382)	1.1 (n=389)
Inland: Florence	77.6 (n=135)	55.5 (n=161)	2.1 (n=386)	32.9 (n=377)	0.7 (n=377)

areas of the country. Our findings do demonstrate that in the area with the most long-term stormwater education in which Carolina Clear is a participant, respondents were more likely to identify that stormwater is not treated before discharge to local waterways when compared to the most new area receiving this education through this program

This data collection effort will also provide baseline data for measuring effectiveness of future stormwater education efforts in these four areas of South Carolina. The 2010 *MS4 Permit Improvement Guide* (EPA) suggests telephone surveys as a means to assess behavior change and increased awareness; responses from this survey instrument have already influenced outreach activities, assisted in prioritizing targeted pollutants and behaviors and have revealed valuable information about individual regions and regional comparisons. Future research efforts will utilize sociodemographic information to further determine target audiences and methods of communicating this program's environmental protection messages.

A more in-depth look at the survey results will be published in the *Journal of Contemporary Water Research and Education*.

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