MASTER'S PROJECT

Analysis of Storm Water Outreach Programs in the Upstate, South Carolina

By

Laura McCoy Thomas

March 21, 2011

Duke Environmental Leadership Masters of Environmental Management

Approved By:

_____

Dr. Elizabeth Shapiro– Primary Advisor

Nicholas School of the Environment

Contents

Abstract

Public education and outreach are important components of most non-profit and government programs. This research project was motivated by a requirement of the National Pollutant Discharge Elimination System (NPDES) permitting program, which is a component of the Clean Water Act, which requires municipalities to include public education and outreach as components of their storm water programs. In this research project I posed the question: How can storm water management programs be designed to promote optimal outreach and education? I chose the programs offered by Upstate Forever as a focus of my research. Upstate Forever is a non-profit organization that operates in the ten-county region that comprises the upstate of South Carolina, and has partnered with many municipalities to provide storm water management outreach and education initiatives that meet the requirements set by the NPDES.

In order to analyze the impact and effectiveness of Upstate Forever's storm water public education and outreach programs; I designed a survey, with the input of Upstate Forever, to compare their Low Impact Development Series, Watershed Leaders Forums and Storm Water Symposiums. The survey was administered to former participants in these programs. I assessed the respondents' level of knowledge of the workshop topic before they attended, the quality of the information presented, and whether or not the presentation would influence future behavior.

The results of this study indicate that Upstate Forever's outreach and education events have been well received and the participants believe that they have been very useful. The Low Impact Development series has had the highest attendance with participation dominated by industry (engineers / developers) and government officials. Results also indicate that to expand the scope

and audience for their programs, Upstate Forever should increase their marketing to non-professionals and build in more networking/discussion time into the seminars.

Acknowledgements

I would like to thank the following people for all of their help and support on this project. The people at Upstate Forever for allowing me to work with such a great organization and dedicated staff. Lisa Hallo provided invaluable information and support throughout the process – scanning in old surveys, distributing new surveys and compiling great background information on their programs, without her support and that from the rest of Upstate Forever I would not have been able to complete this project. Dr. Elizabeth Shapiro for all of her help and guidance as my advisor during this process. My wonderful husband Duane for his support during the entire graduate process, and our son who as a new addition was happy to share Mom's lap with a computer for the first few months of life.

Introduction

In 1948 Congress enacted the Federal Water Pollution Control Act (WPCA), setting in motion the first national policy to address water pollution. Environmental disasters, such as the Cuyahoga River fire increased public awareness and in 1972 Congress passed a vast spectrum of amendments to the WPCA. The law, as amended in 1977, became known as the Clean Water Act (CWA). Section 402 of the Clean Water Act created the National Pollutant Discharge Elimination System (NPDES) permitting program.[1]

The National Pollutant Discharge Elimination System program is one of the mechanisms through which the CWA attempts to fulfill the stated goal of protecting and improving the nation's waterways. The NPDES program regulates point sources that discharge pollutants to waters of the United States.[2] According to the Environmental Protection Agency (EPA) point sources are defined as 'discrete conveyances such as pipes or man-made ditches'[3]. Single Family residences which are connected to a municipal system, rely on a septic tank or have no surface discharge are not required to obtain NPDES permit coverage. Facilities, such as new construction sites or manufacturing groups, which discharge to surface waters must obtain permits. The EPA authorizes most states to administrate the NPDES permit program. In 1975 the South Carolina Department of Health and Environmental Control (DHEC, the Department)

---

1. "Clean Water Act", Environmental Protection Agency, accessed 9/17/2010, http://cfpub.epa.gov/npdes/cwa.cfm?program_id=45
2. "National Pollutant Discharge Elimination System", Environmental Protection Agency, accessed 9/7/2010, http://cfpub.epa.gov/npdes/home.cfm?program_id=45
3. "Storm water Phase II final rule, small MS4 Storm water program overview", Environmental Protection Agency, accessed 9/17/2010, http://www.epa.gov/npdes/pubs/fact2-0.pdf

was designated by the Environmental Protection Agency (EPA) to administer the NPDES program in the state of South Carolina. [4]

In 1987 the CWA was amended through passage of the Water Quality Act (WQA), creating the modern version of the CWA. The WQA established a phased in approach to the revised NPDES program for municipal and industrial storm water discharges. Through this phased approach construction sites were mandated to control storm water erosion and sediment originating on site.[5]

The NPDES storm water program was enacted as part of the WQA in 1990. Phase I included construction activities which disturbed five acres or greater and municipalities with 100,000 people or more that owned or operated a Municipal Separate Storm Water Sewer System (MS4). Phase II of the program was signed into law in 1999, this phase expanded the scope of Phase I to include smaller communities of less than 100,000 and entities that own or operate an MS4. There are six components of the MS4 program, considered as the minimum control measures: public education and outreach, public participation/ involvement, illicit discharge detection and elimination, construction site runoff control, post construction runoff control and pollution prevention/good housekeeping.[6] My research focuses on the public education and outreach component of the MS4 program, evaluating the impact and effectiveness of the educational

---

[4] "NPDES Permitting", Department of Health & Environmental Control, accessed 7/29/2010, http://www.scdhec.gov/environment/water/npdespage.htm

[5] "Clean Water Act", Environmental Protection Agency, accessed 9/17/2010, http://cfpub.epa.gov/npdes/cwa.cfm?program_id=45

[6] "National Pollutant Discharge Elimination System", Environmental Protection Agency, accessed 9/7/2010, http://cfpub.epa.gov/npdes/home.cfm?program_id=45

programs delivered by one non-profit organization in South Carolina as a way of understanding how these initiatives can best be designed and implemented.

Project Background

Upstate Forever (UF) is a nonprofit organization that covers Abbeville, Anderson, Cherokee, Greenville, Greenwood, Laurens, Oconee, Pickens, Spartanburg and Union counties, the upstate region of South Carolina. Their mission is to, "promote sensible growth and protect special places in the Upstate region of South Carolina"[7]. As part of this mission UF seeks to, "work to protect and improve water quality in our region's waterways by minimizing the impact of storm water, protecting watersheds, and ensuring adequate stream flows and lake levels"[8].

Upstate Forever holds a series of seminars focused on water quality and reducing the impacts of storm water in the upstate, focusing on the upstate regions community (interested citizens, engineers, construction workers and other industry players). These seminars and workshops are designed to help the participants learn how to best address some of the issues within the NPDES permitting process. The seminars are designed to be informational and inspirational – informing and inspiring more collaborative and environmentally beneficial site design. This project will compare and evaluate the effectiveness of the public education and outreach programs that are being implemented by Upstate Forever, focusing on storm water education efforts. The goal of this project is to determine which programs currently in use are the most effective so that the

[7] "Upstate Forever", Upstate Forever, accessed 10/19/2010, http://www.upstateforever.org/about.html

[8] Ibid

organization can make better informed decisions as to how to best implement outreach programs in the future, especially in the context of upcoming regulation changes.

My research is focused on the public education and outreach as well as the public participation/ involvement components that have been implemented by Upstate Forever. The EPA defines public education and outreach as, "distributing educational materials and performing outreach to inform citizens about the impacts polluted storm water runoff discharges can have on water quality"[9]. Public Participation/Involvement is defined as, "providing opportunities for citizens to participate in program development and implementation, including effectively publicizing public hearings and/or encouraging citizen representatives on a storm water management panel"[10].

With the input of Upstate Forever I designed a survey to compare their Low Impact Development series, Watershed Leaders Forums and Storm Water symposiums. The survey was designed to ascertain the respondents' level of knowledge of the topic of the workshop before they attended, the quality of the information presented, and whether or not the presentation would be likely to influence future behavior.

[9] "Sediment, Erosion, and Storm water Management Program", Department of Health & Environmental Control, Accessed 5/20/2010 http://www.scdhec.gov/environment/water/swerfmain.htm

[10] Ibid

This research was designed to evaluate the effectiveness and impact of Upstate Forever's current storm water education and outreach initiatives with the intention of employing the results to develop recommendations for improvements in the future.

Low Impact Development Series

Low Impact Development (LID) is defined by the EPA as, "an approach to land development (or re-development) that works with nature to manage storm water as close to its source as possible"[11]. LID uses pre-existing natural features, or re-creates them, decreasing the total impervious area and restoring, or maintaining more natural drainage patterns and flow.[12] LID is a more sustainable storm water practice that may be applied to any site and helps developers comply with NPDES regulations in more environmentally, fiscally and aesthetically pleasing ways.

LID measures tend to provide higher levels of water quality treatment through higher volume control of the 'first flush'; the first ½ inch of rainfall which carries the highest pollutant load. LID practices can typically control up to the first 2 inches of runoff, controlling a greater volume of annual runoff. LID practices increase infiltration and can be used as a means of pollutant removal. These bioretention systems, such as grass swales, bioretention ponds, and rain gardens,

[11] "Polluted Runoff (Nonpoint Source Pollution)". Environmental Protection Agency, accessed 2/7/2011, http://epa.gov/owow/NPS/lid/

[12] IBID

have been shown to remove high percentages of heavy metals and nutrients as compared with conventional systems.[13]

Upstate Forever has created their various outreach and education efforts to introduce new concepts to the development community (developers, engineers, etc) and educate citizens about how they can contribute to conserving the resources of the Upstate. The LID Speaker series mostly aims to reach out to construction and development industry professionals to encourage the use and design of Low Impact Design concepts in new construction sites. The LID series held by Upstate forever tried to achieve several main goals:

1. *Introduce participants to LID concepts, ideas, and implementation projects.*
2. *Encourage a paradigm shift from conventional storm water management to more innovative techniques (for practitioners).*
3. *Encourage a paradigm shift from conventional storm water management related policies to regulations allowing for more innovative approaches (for policy makers).*
4. *Establish and cultivate positive working relationships with series partners:*
    - *Greenville 2008 – Homebuilders Association*
    - *Spartanburg 2009 – Spartanburg County Storm water Managers*
    - *Anderson 2009 – Anderson County Storm water Managers*
    - *Pickens 2010 – Pickens County Storm water Managers*
    - *Anderson 2010 - Anderson County Storm water Managers*[14]

---

[13] Low Impact development (LID): A literature review. Environmental Protection Agency, EPA-841-B-00-005. October 2000. http://www.epa.gov/owow/NPS/lid/lid.pdf

[14] Summary of Goals, Lisa Hallo, Upstate Forever, correspondence 12/7/2010

The series was presented as a limited, multi-session series (the 2009 Anderson series for example was comprised of 3 lectures), held once monthly during each year with a speaker presenting a topic related to Low Impact development over a one-hour session. At the start of the session UF had each participant sign in, and at the end those in attendance received a continuing education credit (for engineers) and were asked to complete a satisfaction survey. This survey was very limited in scope, however and needed to be broadened so as to be adequately compared to the other two programs reviewed in the scope of this research project.

Watershed Leaders Forum

Watersheds are defined as, "the land area that drains water to a particular stream, river, or lake."[15] SCDHEC divides the state into 8 main watersheds, with many smaller watersheds draining to these areas. The upstate region encompasses three of these main watersheds: the Broad, Saluda and Savannah. Of the three watersheds, the Broad is considered a priority watershed by SCDHEC and the Saluda River was named one of America's most endangered rivers by the American River organization. Rivers are considered endangered if they face imminent threat (such as sewage pollution, and additional dams) but through public awareness and influencing policy makers the rivers health can be saved.[16] In light of the state of the region's waterways, Upstate Forever held a series of Leadership forums with the aim to, "educate participants about WLF [Watershed Leaders Forum] topics."[17]

---

[15] "Water Science Glossary of Terms", United States Geological Service, accessed 2/8/2011, http://ga.water.usgs.gov/edu/dictionary.html#W

[16] "America's Most Endangered Rivers™ FAQ", American Rivers, Accessed 3/6/2011, http://www.americanrivers.org/our-work/protecting-rivers/endangered-rivers/background/faq.html

[17] Summary of Goals, Lisa Hallo, Upstate forever, correspondence 12/7/2010

The Watershed Leaders Forum is targeted towards members of the community who are interested in greenway development and those who live on or near waterfront to discuss waterfront issues and how to manage storm water on an individual level. These community members are targeted in order to educate them of their rights and responsibilities as waterfront owners or those interested in greenway development. The topics and specific goals for these forums are below:

- *Watershed Leaders Forum 3*
  - *To build support for the swamp rabbit trail (*A greenway trail in Greenville, SC that goes originates downtown and extends to Travelers rest, a small town about 10 miles away.*).*
  - *To shift the thinking of floodplains from liabilities to assets.*
  - *To change the type of development that occurs within the floodplain.*
  - *To shift thinking of greenways to an economic development engine rather than an amenity with a cost.*
  - *To serve as a gathering place for partners interested in the Swamp Rabbit Forum (*community members interested in developing the swamp rabbit trail.*)*
- *Watershed Leaders Forum 4*
  - *To educate lake landowners on importance of near-shore landscaping and storm water runoff and get them to change practices.*
  - *To help spur lake residents to get engaged in a Lake Association group.*

- *To collect contact information and names of interested individuals for the association (and leadership positions).*[18]

Storm Water Symposiums

According to the EPA, "storm water is generated when precipitation from rain and snowmelt events flows over land or impervious surfaces and does not percolate into the ground."[19] Chemicals, oils and other pollutants are transported to streams and other water bodies as the precipitation flows over the land and or impervious surfaces. The NPDES program is designed to aid in protecting surface water quality and quantity.

The Storm Water Symposium was targeted towards members of the community who are interested in storm water issues, to educate the community on how to deal with issues on an individual level and create a place to discuss local concerns and issues. The goals of the Storm Water Symposium were to:

- *Introduce participants to new storm water regulations, as well as LID concepts.*
- *Establish a positive working relationship with Anderson County.*[20]

Anderson County is a designated Municipal Separate Storm Water Sewer System (MS4) under Phase II of the NPDES program. Phase II of the NPDES program requires that smaller communities (less that 100,000) develop a program to reduce storm water pollutants. Under this program MS4s must implement certain minimum control measures including public education and outreach, public participation/ involvement programs. Upstate Forever partners with Anderson County and other MS4's to promote better design and understanding. These outreach

[18] Summary of Goals, Lisa Hallo, Upstate forever, correspondence 12/7/2010

[19] "National Pollutant Discharge Elimination System"

[20] Summary of Goals, Lisa Hallo, Upstate forever, correspondence 12/7/2010

events are counted in the MS4s public education and outreach, public participation/ involvement requirements.

Methods

As mentioned previously, I designed a survey in collaboration with Upstate Forever to test the effectiveness of their outreach programs (Appendix A). The survey was administered by Upstate Forever staff so as to protect their proprietary interests in their list of participant names and contact information. I submitted the survey questionnaire and methods to the Duke University Institutional Review Board (IRB) for non medical research for approval of exemption. On January 13, 2011 the IRB found that since no identifiable data was to be used or available to the researcher that the study did not meet the definition for research with human subjects.

Analysis of environmental outreach education and public participation is a relatively new focus of outreach analysis. My Environmental Education Evaluation Resource Assistant (MEERA) is an on-line environmental education evaluation resource that has been developed by University of Michigan, environmental educators, EPA & US Forest Support with the goal of supporting the evaluation efforts of environmental educators. MEERA has developed an 8-step schematic for the design of environmental education evaluation research. These steps are described as follows, "before you get started, clarify program logic, set goals & indicators, choose design & tools, collect data, analyze data, report results & improve program[21]". This report focuses on design & tools, collection of data, data analysis and reporting results. Upstate Forever has supplied the

[21] "Welcome to MEERA", My Environmental Education Evaluation Resource Assistant, Accessed 2/28/2011, http://meera.snre.umich.edu/

goals summary for each outreach event and will use the results to form better outreach events in the future.

In conjunction with the staff of Upstate Forever, I decided that an online survey would be the best method to collect data due to the ability to access a large respondent pool quickly and anonymously. Online surveys are able to reach a large number of participants anonymously and although there are some drawbacks, such as the lack of personal interaction, the ability to maintain participant anonymity influenced the need to employ this format since Upstate Forever agreed to work with me on the condition that their contact list information would remain confidential.[22] We decided to design the survey in a way that would illicit qualitative responses since Upstate Forever already had gathered significant quantitative data through scale based surveys at the end of each lecture series/ outreach seminar except in the case of the Watershed Leaders Forum. We therefore chose to employ an open-ended, questionnaire format for the online survey. The questionnaire (Appendix A) covered a variety of topics such as the respondents: relationship to storm water, purpose for attending and if the program will influence future behavior. By combining the results of both of the on-line survey and the surveys administered directly after the events had been completed a more complete picture of the effectiveness of the programs could be garnered.

The open ended survey questionnaire was distributed by Upstate Forever via an on-line survey engine named Kwik Survey. Kwik Survey was chosen due to its survey management options

[22] "Step 4: Choose Design & Tools" My Environmental Education Evaluation Resource Assistant, Accessed 2/28/2011, http://meera.snre.umich.edu/plan-an-evaluation/plonearticlemultipage.2007-10-30.4643560864/step-4-choose-design-and-tools

and the ability to distribute an unlimited number of questions to an unlimited survey base. Although available data on on-line survey response rate varies, an industry white paper indicates that the average response rate is 26%[23]. This survey (Appendix A) was designed in collaboration with Upstate Forever to assess the goals, results and attitudes of participants in regards to the various seminars and informational lectures. In addition results from surveys (Appendices B&C) administered by Upstate Forever at the end of the Storm Water Symposiums and LID Series presentations were also collected and used for the case study comparison.

A total of 507 program participants were invited to respond to the survey. This sample was chosen from those who had participated in the LID Series, Watershed Leaders Forum or the Storm Water Symposium. They represent industry (engineers, developers, etc) and community members from the upstate region of South Carolina.

Error/ Bias:

Non-Response

Of the 507 past participants who were invited to participate in the survey only a small fraction, 43 or 8.5%, responded. The low response rate was likely due to several factors:

- The seminars and lectures included in this study were conducted from 2006, in the case of the Watershed Leaders Forum through 2010. Due to the time frames involved it is

[23] *Online survey response rates and times*; background and guidance for industry (Ipathia Inc/ Super Survey), Hamilton, Michael B, Accessed 3/6/2011, http://www.supersurvey.com/papers/supersurvey_white_paper_response_rates.pdf

likely that many respondents were not confident in recalling events that they participated in.

- The survey was only open for a two week window which may have limited response rates.

- The survey was conducted via an on-line survey site, and invitations were sent via email. Many participants are busy professionals and may not have had the time to dedicate to such a survey, however due to UF's needs to keep the list proprietary this could not be avoided.

At the end of each lecture series Upstate Forever provided respondents with a survey for the LID Series and Storm Water Symposiums. The results from these surveys have also been included in this analysis.

Error/ Bias:

There are likely several error/biases for this survey as well:

- The surveys were disseminated at each LID series and the Storm Water Symposium but not the Watershed Series which creates a data gap for that series.

- The way in which the surveys were distributed & collected also makes it difficult to know the response rate, although the response is likely to be high as UF representatives were monitoring the exits and the LID series provided continuing education credits for engineers. However, the credit may also have skewed the response rate higher for engineers than other attendees.

- The scale used on the surveys may have also skewed some results as the scale went from most satisfied to least satisfied, and may have confused some survey takers.

Results and Observations

Demographic Data:

Based on the survey sent out for this study, Figure 1 represents the basic occupations of the 43 respondents. The question was very broad in nature and asked respondents relationship to storm water. The categories are broad and reflect the best representation of responses.

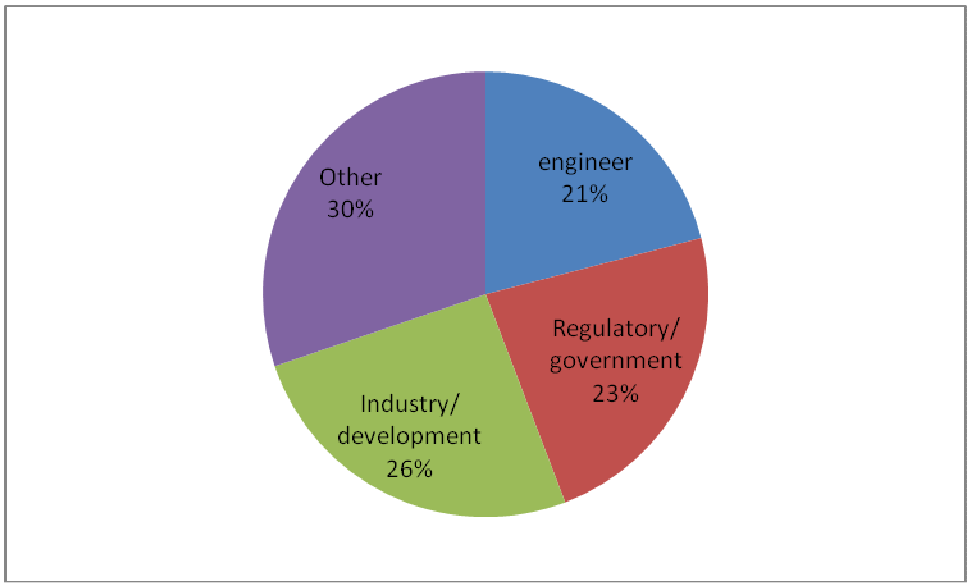

Figure 1: Pie graph of occupational data, based on the respondents relationship to storm water

The largest number of respondents fell into the other category (30%) and represented private citizens, students and other community members. The second largest group was those in industry/ development (26%) who, from survey responses seem to have been drawn to the seminars to learn more about new technologies to help preserve water quality. Many of those in the regulatory/ governments sector (23%) represented municipal, county and state agencies and

may have been drawn to the meetings as part of their need to talk with the community as well as staying aware of new technologies. The last category, engineers (21%) were likely drawn to the seminars not only for professional development and networking but also for the added benefit of receiving free continuing education credits. In this report engineers represent professionally certified environmental engineers who work in the storm water sector, designing and certifying construction site designs.

Meeting publicity

To assess the effectiveness of the various meetings I asked respondents to share how they found out about the meeting they attended. Figure 2 displays their responses.

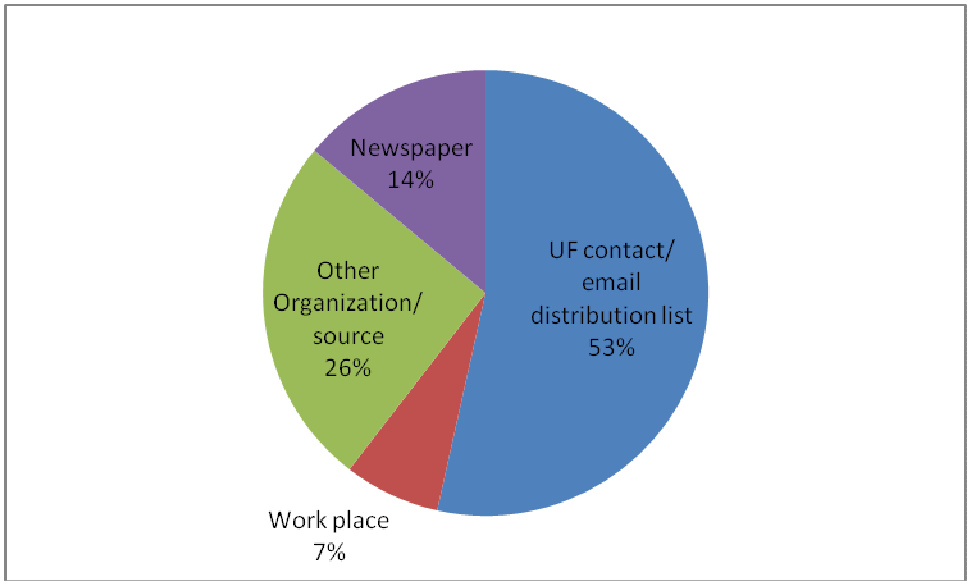

Figure 2: Pie graph representing how respondents first found out about the program.

Upstate Forever's email distribution list appears to currently be Upstate Forever's most effective source of marketing awareness with 53% of repondents finding out about programs through the list. Only a small fraction (14%) of respondents said they heard about the program through published media sources. Expanding the presence and type of media, utilizing social media such

as Facebook and reaching out to like-minded organizations, such as the Sierra Club's contact list should help broaden the scope of particpants as well as increase overall attendance.

Figures 3 & 4 below show the approximate attendance for the outreach events

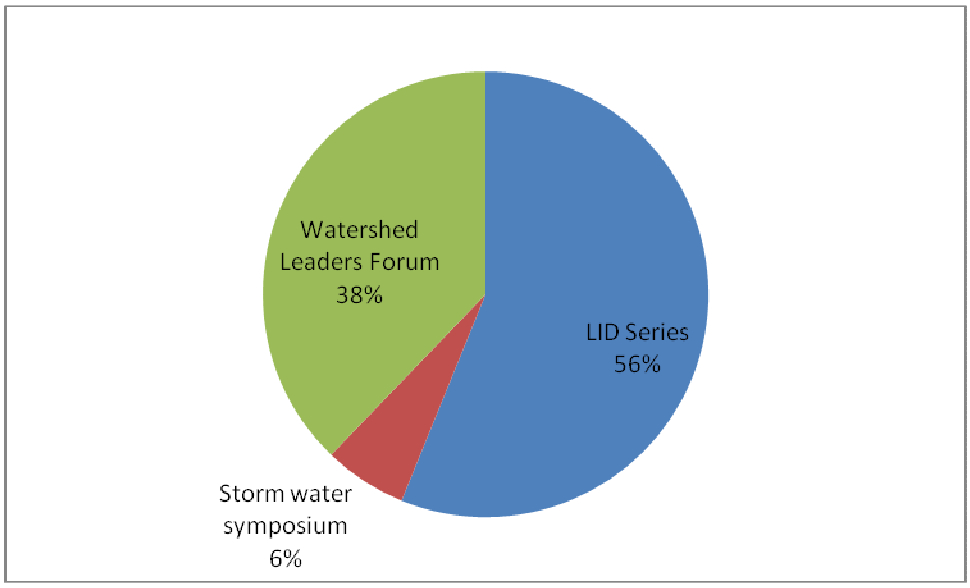

Figure 3: Attendance by event

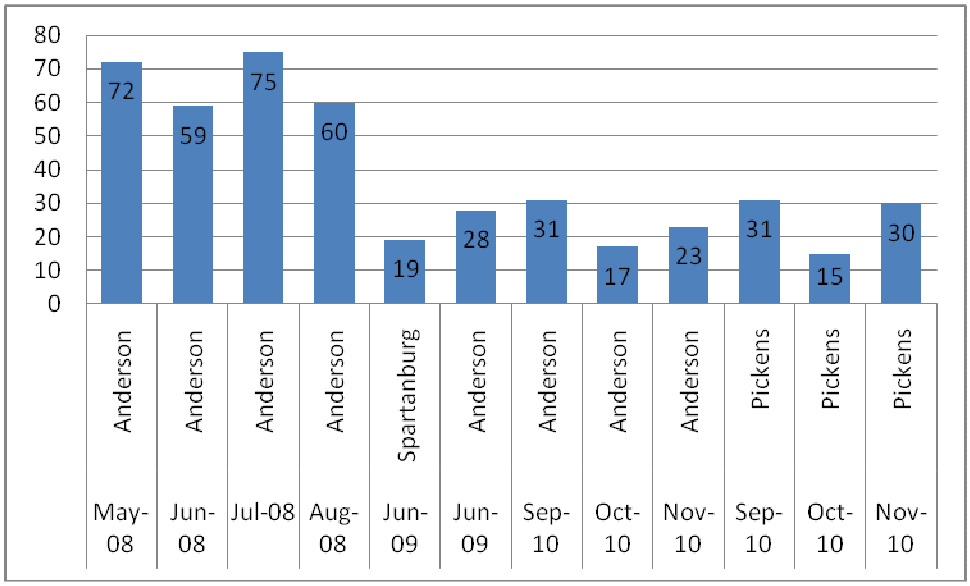

Figure 4: Breakdown of attendance at LID sessions by date & locations

As you can see in the figures above the LID series has had the greatest attendance and of the LID series the events in Anderson are the most well attended.

Opinions of seminar qualities

Of the respondants, all indicated that the event they attended increased their awareness of the topic, and all but one practitioner indicated that they would be more likely to utilize LID or other innovative techniques after the seminar. The respondents were also asked to state how useful they felt each seminar was. Figure 5 & 6 show the total uesfulness of the seminars.

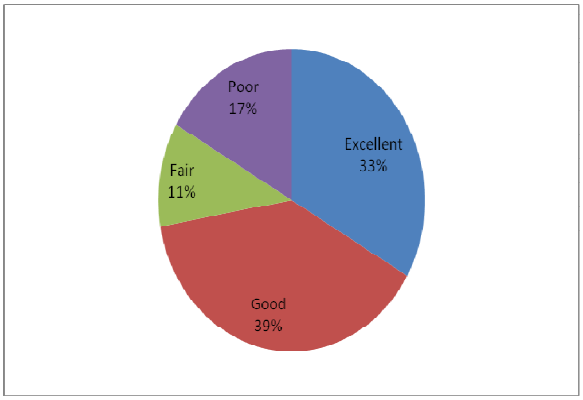

Fig. 5: Usefulness of Storm Water Symposium

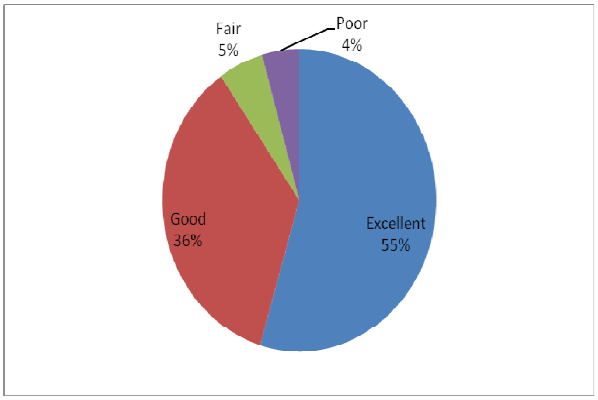

Fig. 6: Usefulness of LID Series

The charts above indicate that overall the LID Series was considered more useful than the Storm Water Symposium. Based on the results gatherd about the Watershed Forum the indication is that the LID Series was percieved as the most useful of the three series.

In the LID series some seminars were more sucessful than others. The respondents said that of the series, the 2010 Anderson series was the most useful (68% excellent) with the best speakers (64 % excellent). The 2009 spartanburg series, however had the best timing (74% excellent), location (89% excellent) and topic (84% excellent).

A large majority of respondents said that lunch was the best time of day to hold the seminars, however there were several comments that indicated a rolling series held in the various locations may be best as a one hour seminar was difficult to schedule for if travel was involved. Respondents for the symposium indicated that the symposium might be better attended if held on a different day (not a Friday) and that the seminar seemed to last a bit too long.

Discussion

The public participation and education efforts held by Upstate Forever have generally been very well received and have produced a number of benefits such as: better relationships with partner organizations and increased awareness of the topics presented. The vast majority of survey respondents felt that the event increased their awareness of the topic and that the seminar was highly useful. The partner organizations such as Anderson County MS4 have also been a great beneficiary as these events have been included in their outreach and education efforts required by their NPDES permit.

This study was limited by a low response rate to the qualitative, on-line survey, only 8.3% (43) of the survey pool responded. The bias introduced by this low response rate was corrected to some extent by the inclusion of data from the scale-based survey distrubuted by Upstate Forever at the end of the LID Series presentations and Storm Water Symposiums. As Upstate Forever moves forward in their programing, a mixed survey with scale based questions and more open ended questions is recommended so that they can more fully understand their audience base and how/ if the subject of the presentation is being/ will be used. UF should also consider following up with program participants in quarterly or yearly formats to see what if any projects they have

done which were influenced by the presentation they attended. This information will be invaluable as UF moves forward in determining the effectiveness of their programs in reaching their stated goals.

LID projects in the upstate represent approximately 30% of LID projects in the state as represented on the South Carolina Low Impact Development (SCLID) Atlas[24]. The SCLID Atlas is part of a national intiative to map inovative storm water practices across the nation. The LID projects can be of any sizeand fall into categories such as: green roofs, rain barrels, and permeable pavement. To determine the true effectiveness of the programs, UF should perform a separate study investigating how many of these projects are directly influenced by their LID Series, Storm Water Symposiums and Watershed Leaders Forum and in what ways. It may be beneficial for UF to follow up with program participants to see what if any of the prinicples they implemented after the seminar. The survey response did not indicate a strong trend one way or the other.

The programs put on by Upstate Forever have been seen as timely and informative. When respondents were asked what programs would be useful for future endeavors, the majority (30%) responded that storm water programs would be the most useful, with environmental (22%) and sustainability (23%) coming in shortly behind, case studies (7%) and other (18%) rounded out the categories.

[24] "South Carolina Low Impact Development Atlas", Clemson University, accessed 3/11/2011, http://www.clemson.edu/public/carolinaclear/lidmap/

Some of the most salinet recomendations for how the programs could be improved were: (Full results of how respondents thought future programs could be improved are in Appendix D)

- *To describe/ show how the technologies being discussed played out in the field*

  This was stated several times. I belive showing real world, local examples would help to strengthen the presentations, in conjunction with this UF could partner with some of these sites and create field trips to selected locations.

- *To develop a forum/time for networking and open discussion to help alleviate the tensions between industry, regulators and private citizens.*

  The ability to openly discuss storm water issues in a moderated setting would be of great benefit to the community, allowing the concerns and viewpoints of each side to be understood by the other could potentially lead to more innovative solutions.

- *In depth discussion of regulations*

  This was mentioned several times. It seems there is confusion as to which agency does what, and what each agency can and can not regulate. It would be fairly easy to include this topic in all three outreach program types.

- *Focus on what individuals can do/ contribute in the process*

  This was mentioned a few times and in various ways. I recommend that Upstate Forever consider including a presention, in their outreach series, of ways for individuals to prevent storm water runoff on their properties, install rain gardens or other methods that individuals could easily implement.

Some of the suggestions for the LID Series, Watershed Forms, and Storm Water Series were to: ensure that the catering is more eco-friendly , build in time for networking and to repeat lectures in several locations to gain a wider audience.

Upstate Forever's marketing and publicity of the meetings appears to be effective, with fairly high turn outs for each event. The July 2008 & October 2010 events are outliers with the highest and lowest attendance accordingly. These events should be studied to see why the attendance was so different from other events, looking into potential factors such as: advertisement/ notification (was there more/ less), timing (did the time of day/ year effect turnout), and subject matter (did the proposed topic generate enough interest) . The respondents also indicated that UF's email distribution list is its most effective means of publicity. If UF is interested in widening its market base then they should investigate why past print media has not been effective and what can be done to improve it. UF could partner with like-minded organizations, such as the Sierra club to expand their email contact list, more use of social media (such as Facebook) could also increase feasibility of these events.

The LID lecture series format appears to be the most successful of the three formats although the Watershed Forum was also well received. Holding the LID series during the lunch hour appears to be very popular. The other outreach series had mixed results on timing, so UF may want to see if the lunch hour success translates over to the other programs. The results on meeting times for the other series were inconclusive, however moving forward this may be something UF wants to experiment with or study further.

I would suggest that Upstate Forever continue to build and expand upon the LID series, making an effort to open the series up to a more diverse audience. The LID series, while the best

attended, tends to be more focused on industry (engineers/ developers) and regulators (these categories made up for 70% of respondants) than citizens or other interested parties. For Upstate Forever to achieve its mission of: "promote sensible growth and protect special places in the Upstate region of South Carolina"[25], they must reach the widest audience possible. To reach out to more community members, Upstate Forever could try both traditional and non-traditional marketing techniques such as newspaper, web ads and partnering with like minded organizations, such as FOLKS (Friends of Lake Keowee Society) and these organizations' membership bases. These methods, were shown to draw in some respondents, however by further developing these resources UF could get a larger participant group. UF's website and email list have been doing an adequate job of publicizing events, however moving forward, UF may want to consider increasing their multi-media efforts. These multi- media efforts may include taking full use of their Facebook page and creating invite events, as opposed to email reminders or using twitter to publicize events. These multi-media efforts would likely draw in a broader audience and perhaps offer a forum to network, something that the respondents wanted to see improved upon. UF already has a presence on twitter and Facebook – events such as the LID series should take full advantage of these to reachout to a wider audience. Posters, newsletters and emails from partner organizations to their base could also help widen the audience.

[25] "Upstate Forever", Upstate Forever, accessed 10/19/2010, http://www.upstateforever.org/about.html

Conclusions

This research project is set on the backdrop of the National Pollutant Discharge Elimination System (NPDES) permitting program, which is a component of the Clean Water Act. The NPDES permitting program requires municipalities that own or operate a Municipal Separate Storm Water Sewer System (MS4) to include public education and outreach in their storm water programs. Upstate Forever, a non-profit organization that operates in the ten-county region that comprises the upstate of South Carolina and has partnered with many municipalities to promote more sustainable growth initiatives through outreach and education programs.

I partnered with Upstate Forever to determine the impact and effectiveness of their storm water public education and outreach programs. In conjunction with Upstate Forever staff I designed a survey to compare their Low Impact Development Series, Watershed Leaders Forums and Storm Water Symposiums. Due to the proprietary nature of the UF contact list UF staff disseminated the survey for me through an on-line survey engine called Kwik Survey. The survey was designed to answer three basic questions: which outreach program is most effective at reaching the stated goal; what contributed to the effectiveness of the program; how should the organization proceed in designing future programs.

The results of this study indicate that Upstate Forever's outreach and education events have been well received and the participants believe that they have been very useful. The Low Impact Development series has had the highest attendance with participation dominated by industry (engineers / developers) and government officials. Results also indicate that to expand the scope and audience for their programs, Upstate Forever should increase their marketing to non-professionals and build in more networking/ discussion time into the seminars. Additionally the

incorporation of real world local examples of the LID technologies and built in discussion and networking time are recommended. Moving forward UF should also investigate the number of LID projects influenced by their programs, to help determine programs effectiveness and investigate ways to improve marketing to a wider audience base.

My results indicate that the components of Upstate Forever's educational and outreach programs that make them successful are the program participants found the programs very useful, and enjoy the topics presented. Respondents felt that the presentation increased their awareness of the topic, and all but one storm water practitioner indicated that they would be more likely to utilize LID or other innovative techniques after the seminar. Upstate Forever also has a good working relationship with program partners, such as municipalities. It is recommended that programs wishing to repeat Upstate Forever's successes: forge strong partnerships with local municipalities, bring in speakers who are experienced in their fields, and cultivate a good, strong impression with the community.

Literature Cited

American Rivers. "America's Most Endangered Rivers™ FAQ". Accessed 3/6/2011. http://www.americanrivers.org/our-work/protecting-rivers/endangered-rivers/background/faq.html

Bora Simmons, trans. *Designing Evaluation for education projects*. (Office of Education and Sustainable Development). Accessed 3/6/2011. http://wateroutreach.uwex.edu/use/documents/NOAAEvalmanualFINAL.pdf

Clemson University. "South Carolina Low Impact Development Atlas". Accessed 3/11/2011. http://www.clemson.edu/public/carolinaclear/lidmap/

Department of Health & Environmental Control. "Sediment, Erosion, and Storm water Management Program". Accessed 5/20/2010 http://www.scdhec.gov/environment/water/swerfmain.htm

Department of Health & Environmental Control. "NPDES Permitting". Accessed 7/29/2010 http://www.scdhec.gov/environment/water/npdespage.htm

Environmental Protection Agency. "Effluent Limitation Guidelines". Accessed 5/20/2010 http://www.epa.gov/guide/construction/

Environmental Protection Agency. "Clean Water Act". Accessed 9/17/2010. http://cfpub.epa.gov/npdes/cwa.cfm?program_id=45

Environmental Protection Agency. "National Pollutant Discharge Elimination System". Accessed 9/7/2010. http://cfpub.epa.gov/npdes/home.cfm?program_id=45

Environmental Protection Agency. "Storm water Phase II final rule, small MS4 Storm water program overview". Accessed 9/17/2010. http://www.epa.gov/npdes/pubs/fact2-0.pdf

Environmental Protection Agency. "Polluted Runoff (Nonpoint Source Pollution)". Accessed 2/7/2011. http://epa.gov/owow/NPS/lid/

Environmental Protection Agency. Low Impact development (LID): A literature review. EPA-841-B-00-005. October 2000. http://www.epa.gov/owow/NPS/lid/lid.pdf

Hallo, Lisa. Upstate Forever. Summary of Goals for events being analyzed/evaluated. Correspondence 12/7/2010

Michael B Hamilton. *Online survey response rates and times*; background and guidance for industry (Ipathia Inc/ Super Survey). Accessed 3/6/2011. http://www.supersurvey.com/papers/supersurvey_white_paper_response_rates.pdf

My Environmental Education Evaluation Resource Assistant. “Welcome to MEERA”. Accessed 2/28/2011. http://meera.snre.umich.edu/

My Environmental Education Evaluation Resource Assistant. “Step 4: Choose Design & Tools”. Accessed 2/28/2011. http://meera.snre.umich.edu/plan-an-evaluation/plonearticlemultipage.2007-10-30.4643560864/step-4-choose-design-and-tools

Storm water Authority. "Phase I of NPDES". Accessed 7/30/2010 http://204.202.251.206/regulatory_data/phase_1.aspx

United States Geological Service. “Water Science Glossary of Terms”. Accessed 2/8/2011. http://ga.water.usgs.gov/edu/dictionary.html#W

Upstate Forever. “Upstate Forever”. Accessed 10/19/2010. http://www.upstateforever.org/about.html

Appendix A

Survey Questions for program participants:

1. How did you learn about _____ program that you participated in, facilitated by Upstate Forever?
2. Before attending what was your relationship to storm water related issues? Explain.
3. What was your primary purpose for attending the meeting?
4. Did you find the program to be helpful or informative?
    a.) If so: why?
        - What was the most helpful/ informative?

    b.) If not why not?
        - What do you believe could be done to improve similar programs?
5. Do you believe that this program will influence your behavior in the future?
    a) How?
6. What programs/ areas do you think are important for Upstate Forever to focus on in planning future events?
7. Please share any other information you think would be helpful in planning future programs.
8. If you attended the LID Speaker Series events or Anderson SW Symposium please answer the following:
    a. Did the event you attended increase your awareness of the topic?

    b. Did the event increase your acceptance of low impact development as a viable stormwater management technique?

    c. If you are a practitioner, did the event increase the likelihood that you would utilize LID, or other innovative, techniques in the future?

    d. If you are a policy maker, did the event increase the likelihood that you would support LID regulations and/or options in the future?

    e. Before the first speaking event you attended, were you aware of Upstate Forever?

    f. Did the event change your perception of Upstate Forever? If so, in what way?

    g. (For project partners) Did partnering with Upstate Forever impact your perception of the organization? If so, how?

    h. (For project partners) Did partnering with Upstate Forever impact your perception of the organization? If so, how?

    i. (For project partners) Did partnering with Upstate Forever establish or improve a positive working relationship with Upstate Forever?

9. If you attended the Watershed Leaders Forum, please answer the following:

j. Did the event you attended increase your awareness about the topic?

k. For Watershed Leaders Forum 3 attendees only:

i. Did attending the event increase your support for the Swamp Rabbit Trail?

ii. Did the event help shift your perception of floodplains from liabilities to assets?

iii. Did the event help shift your perception of greenways to an economic development engine rather than an amenity with a cost?

l. Watershed Leaders Forum 4

i. Did the event increase your awareness of near-shore landscaping (versus mowing all the way to the lake's edge)? For lakeshore owners only, did you change your practices after the event?

ii. Following the event, did you get engaged in a Lake Association group? If so, did you take on a leadership position in that association?

Appendix B

LID Evaluations

1. Please rate the following:

Presentation Time:	___ Excellent	___ Good	___ Fair	___ Poor
Presentation Location:	___ Excellent	___ Good	___ Fair	___ Poor
Presentation Topic:	___ Excellent	___ Good	___ Fair	___ Poor
Presentation Speaker:	___ Excellent	___ Good	___ Fair	___ Poor
Presentation Usefulness:	___ Excellent	___ Good	___ Fair	___ Poor

2. If you chose “Fair” or “Poor” for any of the above, please indicate how we can improve.

3. Has this presentation influenced how you will do your job in the future? If so, in what ways.

4. Please provide any additional comments or suggestions.

Appendix C

Stormwater Symposium evaluation

1. Please rate the following:

Presentation Time:	___ Excellent	___ Good	___ Fair	___ Poor
Presentation Location:	___ Excellent	___ Good	___ Fair	___ Poor
Presentation Topic:	___ Excellent	___ Good	___ Fair	___ Poor
Presentation Speaker:	___ Excellent	___ Good	___ Fair	___ Poor
Presentation Usefulness:	___ Excellent	___ Good	___ Fair	___ Poor

2. If you chose “Fair” or “Poor” for any of the above, please indicate how we can improve.

3. Has this presentation influenced how you will do your job in the future? If so, in what ways.

4. Please provide any additional comments or suggestions.

Appendix D

Full survey results describing how to improve future events

What programs or areas do you think are important for Upstate Forever to focus on in planning future events?

- Stormwater and environmental, those are key for our area
- Evaluation of what was presented on paper and how it actually is working in the field.
- Stormwater infrastructure, water and sewer infrastructure, latest regulatory changes involving water.
- I am heavily involved with industrial storm water regulations so I am biased towards that emphasis. In talking with my clients I think there is a great deal of confusion on the construction storm water side so I think some emphasis on the area would also be beneficial.
- Anything environmental
- Work directly with invitation only events to bring collaboration on storm water issues that address water quality issues while using modern technology that is cost effective. These collaboration type meetings will help everyone understand the issues and alleviate the sometimes Us vs. Them mentality
- All of Upstate Forever's programs are important and the organization is a tremendous asset to the region. Upstate Forever educates and advocates in a very professional manner through programs related to community growth, sustainability and quality of life. The work they do advances the discussion of these issues and permeates the public consciousness to bring about real change in policies and practices.
- Waste water treatment, Green space allotment. Construction planning.
- I would try to tie construction stormwater issues together with agricultural stormwater issues.
- Sustainability, LEED, stormwater best management practices case studies
- Develop a plan/timeline. Keep everyone informed.
- Community education of state and local regulations and ordinances. In addition to these what sort of things are not regulated and how to implement bmp's to address additional problems not regulated.
- Green infrastructure, I & I, and in-stream flow
- Air quality education. Grey water reuse. PDR and TDR programs. Continued water quality education programs.
-
- Any program that addresses the future infrastructure needed to maintain clean water and air, as well as supply the energy we need to sustain positive growth.
- I would like them to put on a seminar that *only* addresses MS4's, if possible.
-

- General stormwater issues & information
- Residential rain gardens, green event planning, water/energy/waste in special emphasis neighborhoods,
- Coordination with local/state agencies.
- Sustainable construction of commercial and residential buildings
- Education, proving economic benefit of their work (Why it is better to develop certain ways economically & what environmental benefits are, not just in terms of narrative benefits, but also $$$).
- I would like to see more green building and sustainable development topics. I believe the local branch of the USGBC could be a great partner for Upstate Forever and would like to see them collaborate and reach their combined membership with high impact programs.
- The evolving stormwater regulations and a transition from the Low Impact Development (LID) concepts to the broader Green Infrastructure (GI) concepts.
- Continuing to share information that helps the environment through both business and home considerations - so people don't think of themselves as only being environmentally responsible when they are at home.
- Minimal regulation.
- Focus on what individuals can do on their own property to promote the well being of the lake, prevent erosion, etc. Also promote community action to make sure large developments on or near the lake are done in a manner which protects our valuable water resources.
- One thing they need to do is not offer bottled water at events. They are not always responsible for arranging the water but it is just not ideal to have disposable bottles at a conservation based function.
- Air quality concerns and more recent restrictive requirements on Phosphorus and Nitrogen levels in H2O run off.
- Continue the education programs as I understand some jurisdictions in SC are going to look at this when allowing inspectors to operate in their areas.
- Sustainable practices will continue to evolve and need to constantly be updated.
- I wouldn't want to limit their ideas. They do a good job of addressing current issues.
- Planning to dredge Lake Greenwood in the future
- Results of cleaning up the environment, and the costs to do so.
- Stormwater, TMDL compliance, fecal runoff from agricultural farms.
- I think a good program would be on recycling of building wastes. I see too many dumpsters on building sites that throw away too much scrap lumber and cardboard.

  Also a program to help preserve existing trees on development sites.
- Continued programs on grassing for stabilization/water quality treatments for oxygenation of water.
- Broad education on conservation issues
- To eliminate pollutants entering our water streams

- Water quality and non-point source discharges
- It should continue educating young engineers and local long term land owners that

because the Upstate terrain is so unique that property values can be maximized by taking advantage of the terrain through quality design and engineering. Projects should be designed to fit the terrain not vice versa. Greenville can easily be turned into Kansas, but Kansas can never be turned into Greenville.

- Innovative practices and BMP's in stormwater. Post-development stormwater maintenance