

NPDES and Education on Stormwater Pollution

May 2012

written by
Martha Corrozi Narvaez and Andrew Homsey

with
Erin McVey

of IPA's
Water Resources Agency



*This project is funded by the
Delaware Department of Transportation
and the
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Preface

It is the mission of the Institute for Public Administration's Water Resources Agency (WRA) at the University of Delaware to provide water-resources policy and planning assistance to governments and entities throughout Delaware and the region. In keeping with WRA's mission, IPA presents this report to provide guidance to DelDOT, New Castle County, and six municipalities in meeting the National Pollutant Discharge Elimination System (NPDES) education and outreach requirements.

As authorized under the Clean Water Act, the NPDES controls water pollution by regulating stormwater, which discharges directly into surface waters. New Castle County, DelDOT and six municipalities—Bellefonte, Delaware City, the Town of Elsmere, the City of Middletown, the City of New Castle, and the City of Wilmington—are Phase I co-permittees for the discharge of stormwater from and through all portions of the municipal separate storm-sewer system (MS4) in New Castle County, as authorized under the NPDES and the laws of the State of Delaware. This report provides guidance for DelDOT and the co-permittees to achieve the education and outreach requirements of the NPDES permit. It intends to make the education and outreach efforts more effective and meaningful for New Castle County, DelDOT and the six municipalities regulated under the permit.

This report discusses the following project components:

- Stormwater-education initiatives undertaken by DelDOT;
- Stormwater-education campaigns conducted by government and nongovernment organizations in Delaware and throughout the country;
- Workshop held for the co-permittees and the key concepts learned to develop an effective education campaign; and
- Recommendations on how to achieve the stormwater-education requirements in the eight Target Areas defined in the permit.

The information contained in this report provides guidance toward the development of a refined Stormwater Education and Outreach Plan, as required by the NPDES Phase I permit.

I would like to acknowledge the project team members. While a research assistant at IPA, Erin McVey researched and collected data for this report. Associate policy scientists Martha Corrozi Narvaez and Andrew Homsey led the project team and authored this important document. This report demonstrates a collaborative effort among IPA's Water Resources Agency, DelDOT, and New Castle County to assist DelDOT and co-permittees in meeting the education requirements as set forth in the NPDES in an effective and efficient manner. DelDOT and the Delaware Center for Transportation provided the funding for this project.

It is our hope that this partnership will continue and will result in an informed public, reduced pollution, and cleaner rivers and streams throughout Delaware.

Jerome R. Lewis, Ph.D.
Director, Institute for Public Administration

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Executive Summary

Controlling and managing stormwater that runs off roadways—impervious surfaces—into the state’s surface waters are a major part of DelDOT’s responsibilities. As authorized under the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) controls water pollution by regulating stormwater that discharges directly into surface waters. New Castle County, DelDOT, and six municipalities—Bellefonte, Delaware City, the Town of Elsmere, the City of Middletown, the City of New Castle, and the City of Wilmington—are Phase I co-permittees for the discharge of stormwater from and through all portions of the municipal separate storm-sewer system (MS4) in New Castle County as authorized under the NPDES and the laws of the State of Delaware. In order to meet the requirements of the NPDES permit, the co-permittees (named above) must meet specific education and outreach requirements outlined in the NPDES permit.

This report provides guidance for DelDOT and the co-permittees for achieving the education and outreach requirements of the NPDES permit. It intends to make the education and outreach efforts more effective and meaningful for New Castle County, DelDOT and the six municipalities regulated under the permit.

Though the University of Delaware served as the lead agency, this project was conducted using a team approach, with direct consultation provided by representatives from DelDOT and New Castle County. This report discusses the following project components:

- Stormwater-education initiatives undertaken by DelDOT
- Stormwater-education campaigns conducted by government and non-government organizations in Delaware and throughout the country
- Workshop held for the co-permittees and the key concepts learned to develop an effective education campaign
- Recommendations on how to achieve the stormwater-education requirements in the eight Target Areas defined in the permit

DelDOT currently undertakes a variety of education and outreach efforts surrounding stormwater issues. Augmenting and enhancing existing resources and programs are crucial tools in the development of any further educational efforts. Additionally, there are a number of nationally recognized stormwater education programs that can be used as a model for DelDOT to implement Delaware-specific programs based on those which have proven most successful and cost-effective elsewhere.

At a workshop hosted by Water Words that Work, LLC, the project team and co-permittees learned about effective outreach and marketing techniques for environmental issues. DelDOT, the co-permittees, and the project team came to understand the importance of the following concepts for an effective education campaign:

- Know your target audience.
- Use new data and innovative web tools to focus in on your target audience.
- Ensure effective design of all outreach materials (e.g., graphics and slogans).
- Be aware of “the slope,” or the rate of conversion of people whose behavior is actually changed.

- Keep in mind the costs versus the benefits of any campaign.
- Leverage existing resources (don't "reinvent the wheel").
- Conduct surveys to assess the effectiveness of your message.

Using this information, a set of eight recommendations was developed for each of the following Target Areas, which are derived from the educational requirements of the NPDES permit:

1. Illicit Discharges
2. Motor Oil/Hazardous Waste
3. Yard/Pet Waste
4. Lawn Irrigation/Car Washing
5. Lawn Care
6. Public Participation/Stream Clean-Ups
7. BMP Maintenance
8. LID/Green Technology

In this report each of the eight Target Areas is addressed. For each one of these the goal, target audience, recommended approach, scale of impressions, and costs are discussed in detail. Each one of these recommended approaches provides guidance toward the development of a refined Stormwater Education and Outreach Plan, as required by the NPDES Phase I permit.

Chapter 1 – Project Introduction

1.1 Overview

DelDOT owns and operates nearly all the roadway systems in Delaware, comprising over 5,000 miles of roads and associated storm drainage systems. Controlling and managing stormwater that runs off these impervious surfaces into the state's surface waters are a major part of DelDOT's highway construction budget.

Impervious cover is any surface in the landscape that cannot effectively absorb or infiltrate rainfall. This includes driveways, roads, parking lots, rooftops, and sidewalks. When natural landscapes are intact, rainfall is absorbed into the soil and vegetation. These natural mediums, or pervious cover, naturally slow down, spread out, and soak up precipitation and runoff. Water percolating into the soil becomes a stable supply of groundwater, and the runoff is naturally filtered of impurities before it reaches creeks, streams, rivers, and bays. A growing body of scientific literature has shown that groundwater recharge, stream base flow, and water quality measurably degrade as impervious cover increases.

As authorized under the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) controls water pollution by regulating point sources that discharge directly into surface waters. New Castle County, DelDOT, and six municipalities—Bellefonte, Delaware City, the Town of Elsmere, the City of Middletown, the City of New Castle, and the City of Wilmington—are co-permittees for the discharge of stormwater from and through all portions of the municipal separate storm-sewer system (MS4) as authorized under the NPDES and the laws of the State of Delaware. The Delaware Center for Transportation's (DCT) 2007 Transportation Education, Research and Security Forum identifies NPDES and education of nonpoint source pollution for the public as important issues related to the transportation system in Delaware and the Northeast Corridor.

In order to meet the requirements of the NPDES permit, the co-permittees (named above) must meet the education and public outreach requirements outlined in the NPDES permit. This report proposes to assist the co-permittees in achieving the education requirements of the permit and making these efforts more effective and meaningful for New Castle County, DelDOT and the six municipalities regulated under the permit while addressing important issues named in DCT's 2007 forum.

1.2 Project Details, Methodology, and Outcomes

This project, NPDES and Education on Nonpoint-Source Pollution, was led by the University of Delaware with funding provided by DCT and DelDOT.

The University of Delaware's Water Resources Agency (WRA), a unit of the School of Public Policy & Administration's Institute for Public Administration (IPA), served as the lead entity. However, the project was conducted using a team approach, with consultation provided by DelDOT and New Castle County representatives. WRA staff—associate policy scientists Martha Corrozi Narvaez and Andrew

Homsey served as the project leads. While an IPA research assistant, Erin McVey conducted valuable research for this project. Marianne Walch served as the lead contact on behalf of DeIDOT. Additional team members who provided feedback and consultation throughout the project include Randy Cole (DeIDOT), Ellie Mortazavi (New Castle County), and Michael Harris (New Castle County).

The project team met on a regular basis to discuss project progress, research findings, workshop information, and the final report. Below is a list of project meeting dates and times:

- October 10, 2010
- November 15, 2010
- July 12, 2011
- September 28, 2011
- January 31, 2012

The project methodology comprised four distinct tasks:

Task 1: Research stormwater-education initiatives that have been undertaken by DeIDOT for NPDES compliance and related to nonpoint-source runoff.

Task 2: Conduct a literature review of education campaigns about stormwater runoff that other municipalities and towns in Delaware and throughout the country have implemented both for general education and to meet the requirements of the NPDES permit.

Task 3: Host a workshop for the co-permittees to discuss critical components of developing an education campaign, such as identifying the target audience, selecting the best communication method, using the right tools, and turning simple actions into meaningful results.

Task 4: Compile a report that brings together the information collected in Task 1 and 2, the lessons learned at the workshop, and the feedback provided at the workshop. With this information and further analysis, provide a recommended path forward to meet the education requirements in the NPDES permit.

Through the expertise of the project team and the established methodology there are several expected outcomes for this project. These include the following:

- Identify NPDES and non-NPDES stormwater-quality education programs.
- Determine the applicability of specific stormwater-education programs in Delaware.
- Coordinate key stakeholders and NPDES co-permittees (public-private partnerships).
- Recommend an implementation plan for DeIDOT and the NPDES co-permittees to achieve the NPDES education requirements and conduct the most effective stormwater-quality-education program.

This report will provide information on each one of the above project outcomes.

Chapter 2 – NPDES Program and Education Requirements

2.1 NPDES Summary

The NPDES permit program is an effort to improve the quality of water running off into waterways of the United States. Discharge from a point source into federal waters always requires a NPDES permit, and discharge into a municipal stormwater system may require a permit, depending on the contents of the discharge. There are two phases (Phase I and II) of the NPDES program, which are designated by the size of the population in the area covered by the permit. In 1990 the Phase I Regulations were issued to include municipalities with a population of 100,000 or more. The Phase I permit program requires industries and municipalities to acquire a permit for the water discharged into a waterway. In 1999 Phase II permit requirements were issued to smaller municipalities with municipal separate storm-sewer systems (MS4s). Not all smaller municipalities with MS4s require a NPDES permit, and this is determined by the “quantity and nature” of the runoff and the “nature of the receiving water” (Part 122.26 of Chapter 1, Title 40). The NPDES program requires a permit if the discharge is associated with an industrial activity, is from a large municipal MS4, or is from a medium MS4. The EPA defines a large MS4 as located in an incorporated place with a population of 250,000 or more. A medium MS4 is located in an incorporated place with a population of 100,000 or more but less than 250,000 (Part 122.26 of Chapter 1, Title 40). If an industrial activity does not generate runoff into an MS4, an individual permit is needed.

DelDOT has a Phase I permit, issued in 2001, that covers all of New Castle County and a Phase II permit, issued in 2003, that covers heavily populated areas of Kent and Sussex Counties. The Phase I permit requires DELDOT to work with New Castle County and the municipalities included in the permit to develop a Stormwater Pollution Prevention and Management Program.

2.2 DelDOT’s Phase I Public-Education Requirements

As authorized under the Clean Water Act, New Castle County, DelDOT, and six municipalities—Bellefonte, Delaware City, the Town of Elsmere, the City of Middletown, the City of New Castle, and the City of Wilmington—are co-permittees for the discharge of stormwater from and through all portions of the MS4 under the NPDES and the laws of the State of Delaware. In order to meet these requirements, these entities must meet specific public education and public involvement requirements outlined in the permit.

According to the permit, the permittees must develop and implement an education and outreach program utilizing available media to

1. Increase the knowledge of the target communities regarding MS4s, impacts of urban runoff on receiving waters, and potential BMP solutions,
2. Change the behavior of target communities to reduce pollutant releases to MS4s and the environment, and
3. Decrease the discharge of pollutants to the MS4 by engaging the public.

The Stormwater Pollution Prevention and Management Plan developed and implemented by the co-permittees must include the following components:

- Clear goals and objectives
- Identified target audiences
- Message(s) specific to the target audiences
- Packaging and distribution of the message(s)
- Evaluation of the outreach plan

With the above objectives in mind, there are specific topic areas, or pollution sources, where the co-permittees must focus their public education and outreach efforts. Based on the language in the permit, these include

1. Public reporting of the presence of illicit discharges or improper disposal of materials, including floatables, into the MS4;
2. Proper management and disposal of used motor-vehicle fluids and household hazardous wastes;
3. Proper management and disposal of grass clippings, leaf litter and domestic animal wastes;
4. Proper use of water to limit excess non-stormwater water discharges from activities such as washing cars and lawn irrigation, from entering the storm-sewer system;
5. Proper use, application, and disposal of pesticides, herbicides, and fertilizers by commercial and private applicators and distributors;
6. Public participation events, such as stream cleanups, drain stenciling, etc.
7. Proper maintenance of BMPs directed toward private- and commercial-property owners, and state or municipal entities responsible for maintenance; and
8. Opportunities for residential installation of low-impact development (LID) practices, and the use of Green Technology best management practices (BMPs) that reduce runoff and mimic natural hydrology.

In addition to reaching the public and target audiences about these topic areas the permit requires that the education and outreach program shall include at least two public workshops each year and shall ensure that a minimum of 250,000 impressions per year are made on the general public about stormwater quality via print, local TV access, local radio, Internet, or other appropriate media.

Finally, the co-permittees are required to carry out a statistically valid public-education survey to evaluate the effectiveness of the education and outreach program in increasing public awareness and changing behaviors about stormwater pollution. The baseline survey must be conducted within 18 months of the effective date of the permit with the results submitted to the Department six months after the survey starts. A second survey will be conducted beginning within approximately 3.5 years of the permit (two years after the first survey). Survey results must be submitted to DNREC six months after the survey begins. According to the permit, the two surveys shall be consistent so that results are comparable, and if, upon comparison of the two surveys, no measurable difference in public awareness and behavior is evident, the permittees shall reevaluate their public education and outreach program in order to determine more effective methods of conveying their message.

No later than 12 months from the effective date of the permit, DelDOT and the co-permittees must develop and implement a process for the public to review and comment on the draft Stormwater Pollution Prevention and Management Plan (SWPP&MP). The permittees must also develop and implement a process for consideration of public comments on the SWPP&MP. The education and outreach program must be updated as necessary to remain effective and relevant to current conditions.

Based on the education requirements described above, DelDOT and the co-permittees will need to work cooperatively to develop an effective education campaign. The following chapters provide information on programs that have been implemented statewide and nationwide that the co-permittees can gain insight from or possibly use information from so that new efforts are not redundant or the co-permittees don't "re-invent" the wheel. Recommendations on approaches that focus on the eight Target Areas and achieve the NPDES education requirements, incorporating some of the previous efforts as well as key concepts learned from the workshop, is detailed in Chapter 5.

Chapter 3 – Existing Efforts Toward Stormwater Education

3.1 Introduction and Data Collection

When considering strategies to educate the public about issues related to controlling stormwater, it is important to be aware of similar efforts currently or previously undertaken. In this way one can avoid “reinventing the wheel” and ensure that any new efforts complement or enhance existing programs. The process of educational-outreach review also necessarily includes an assessment of the efficacy of these programs. By evaluating public feedback and speaking with those involved in implementation or assessment, it is possible to determine which approaches are the most effective, both from a cost perspective and in terms of influencing behavior. For the current study, efforts by DeIDOT as well as other groups regionally and nationally were considered.

To gather information about DeIDOT’s current or past efforts in stormwater education and outreach, members of the project team were consulted. Similar canvassing was performed to determine efforts on the part of DeIDOT’s co-permittees in the NPDES stormwater-permitting process. In addition, an annual report review and online searches were performed to find additional programs not discussed and to augment the understanding of the nature of each identified educational effort. Detailed information on these programs is included in Section 3.2.

Information on stormwater-education efforts beyond Delaware was also considered. Information on these programs was found through online searches, the professional expertise of the project team, and discussions with DeIDOT and New Castle County personnel. A series of programs for comparable educational and outreach efforts was identified. Contact was made with individuals at those programs, which included other departments of transportation and local or regional government public works departments. A list of these departments and contacts are included in Appendix A. A series of questions was put to the representative(s) of each comparable program. The questions touched on the following key areas:

- Reason for implementation
- Difficulty of implementation
- Problem areas
- Cost
- Number of impressions
- Public Feedback

The detailed list of questions is provided in Appendix B, and the information gathered specific to each program is provided in detail in Section 3.3.

3.2 DeIDOT Public Education Programs

Over time, DeIDOT has engaged in numerous public education programs to reduce stormwater pollution. DeIDOT has worked independently on numerous initiatives yet has also had the foresight to

partner with organizations throughout the state to accomplish its stormwater-education goals in an efficient and effective manner.

DelDOT is currently active in promoting stormwater education and outreach efforts to citizens. It has created a website with several useful and important links and actively seeks to disseminate information about the importance of keeping pollutants out of the storm-sewer systems through various programs and outreach campaigns. This website and many other education and outreach efforts go toward meeting the requirements of the NPDES permit. An inventory of these efforts was compiled from annual reports (2002-2011), Internet research, WRA staff expertise, and correspondence with DelDOT staff. This information is described in detail below, and Table 1 provides an abbreviated list of the programs.

Stormwater Website

DelDOT's stormwater website (www.deldot.gov/stormwater) provides a central point for the public dissemination of information about stormwater and the NPDES program. The site outlines the major components of DelDOT's stormwater system and the importance of protecting it from contamination. There is information on regulations, efforts underway to control contaminants and monitor problems, BMP descriptions for stormwater control, and many links to educational materials for teachers and educators. The site is a repository for publications about stormwater-related topics and for steps individuals can take to protect the watershed, including tips on waste disposal and contacts for reporting problems or illicit discharges. Many of the resources on the site are available for download, including those that are distributed by DelDOT and may be downloaded and used by educators and the public.

This site also includes a link, "Report a Problem," to report problems with the stormwater system (e.g., clogs, illicit discharges, maintenance, etc.). This link, while combined with reporting for other DelDOT issues such as road conditions, is an easy way to connect with the public and enhance feedback and responsiveness.

Stormdrain Inventory and Marking

To support operation and maintenance efforts by DelDOT, a system-wide inventory of stormwater assets, including inlets, outfalls, pipes, swales, and manholes was compiled in GIS and spatially located with GPS. DelDOT has worked in cooperation with URS Corporation and KCI Technologies on the program to inventory and mark the stormdrains. Such asset inventory provides a critical basis for designing education and outreach programs. Stormdrain marking requires a detailed inventory so that the decals can be applied and maintained in the most efficient manner.

DelDOT worked with the Partnership for the Delaware Estuary to design the stormdrain markers. The markers display the phrase "only rain down the drain" and have been placed on stormdrains to provide a cohesive visual reminder that the storm-sewer system is an interconnected network that leads to Delaware waterways. In 2003 a storm drain marker event was held to kick-off the storm-drain marking.

Tax Bill Insert

With the Delaware Nature Society and New Castle County, DelDOT placed an insert in New Castle County residents' tax bills. This tax bill insert reaches a broad cross-section of households and is likely to be read since it is included with a high-priority mailing.

Doorhangers

Doorhangers (Figure 1) are passed out to homes where an illicit discharge or illegal dumping has occurred. The front side of the door hanger lists the pollutant found, and the back provides information about stormwater pollution and suggestions on how the homeowners can help minimize the problem. This is an important effort because it educates citizens on how to become aware of potential problems in the future.

Tipcards

DelDOT developed tipcards containing information on how to improve water quality and help reduce the negative impacts of stormwater runoff. These materials are printed in bulk and distributed at various public outreach events (such as the State Fair, Coast Day, Community Days, etc.). The tipcards are also disseminated in state employee paychecks.

Public Events

DelDOT is active in disseminating stormwater information throughout Delaware at various public events. Activities at these events include displayed material (boards), an interactive touch-screen stormwater slideshow, an interactive stormwater quiz, and giveaways for visitors. These venues include, but are not limited to, the Delaware Rural Water Association, University of Delaware Coast Day, and the Delaware State Fair.

Anti-Litter-Education Program

In 2005 DelDOT developed an anti-litter-education program for elementary school students across Delaware to educate them about the harmful effects of littering and encouraged participation in the Adopt-A-Highway program. As part of this campaign, DelDOT publishes anti-litter, quarter-page newspaper advertisements in the *Delaware State News*.

Book Covers

DelDOT distributed 4,000 book covers to schools and the general public that highlight stormwater pollution, the water cycle, and watersheds.

Media Outlets

DelDOT has disseminated stormwater-education information through various media outlets, including:

- Public service announcements and ads in several local newspapers, including *Delaware State News*, *Cape Gazette*, and the *Dover Post*.
- TV commercials through Clear Channel Broadcasting and radio spots on WGMD-FM.
- Ads that appear on DART First State buses with the Partnership for the Delaware Estuary.



Figure 1. Illicit-discharge doorhanger

Appoquinimink River Association

An important component to DelDOT's outreach efforts is working with organizations such as the Appoquinimink River Association (ARA) to help promote its message. With DNREC, DelDOT funded and hired a BMP Outreach and Implementation Specialist for the Appoquinimink River watershed. The role of ARA is to lead and execute an education and outreach program to provide information to the public on ways to reduce nonpoint source pollution. ARA has assisted DelDOT in the following ways:

- Developed a "Nonpoint Source Public Events and Programs" manual, printed CDs and hard copies, and distributed (Figure 2).
- Organized a watershed cleanup and DelDOT supported this with manpower, equipment and payment for disposal.
- Developed a watershed presentation for schools and community groups. Once delivered, a follow-up survey was distributed to determine the effectiveness of the presentation.
- Developed an education education/outreach campaign to reduce fertilizer application by changing watershed residents' lawn-care practices. The target audience is both lawn-care companies and residents. This program, established in 2009, is now known as *Delaware Livable Lawns*.
- Implemented a pet-waste campaign. Using the dog-license database, residents in Middletown were sent dog-waste bags, "Bags on Board," and tip cards to help reduce bacteria loads in the watershed.

Adopt-A-Highway Program

DelDOT has established an Adopt-A-Highway program to reduce litter on Delaware's roadways. In-line with this program, Delaware hosted an "Imagine a Litter Free Delaware" day, which was a cleanup day along roads, highways, and community areas in 2005 and 2006.

Interactive Water-Quality Games

DelDOT has developed interactive water-quality games that are used at public events, such as the Delaware State Fair. These games help convey key nonpoint-source-pollution-reduction messages in a fun and hands on way to the public, specifically aimed at children and adults.

Watershed Clean-up

DelDOT supports watershed clean-ups in the Appoquinimink River, Christina River, White Clay Creek and Red Clay Creek watersheds. DelDOT provides manpower and equipment and in the Appoquinimink River watershed it pays for disposal.

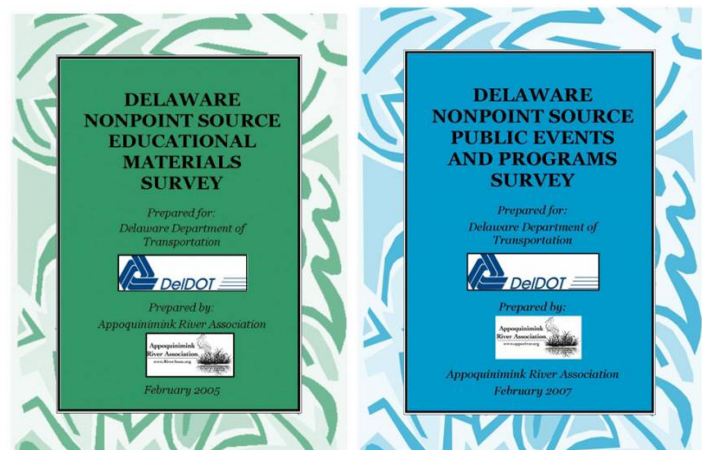


Figure 2. Compilation of Nonpoint-Source Education Materials and Programs

Activity Books and Placemats

With the Partnership for the Delaware, DeIDOT developed activity books and placemats that provide information about topic such as watersheds, stormwater pollution, and the water cycle (Figure 3). The activity books and placemats are distributed to schools, restaurants, and the public.

Watershed Training Course

With the Delaware Nature Society, DeIDOT has developed and delivered a watershed training course to DeIDOT and New Castle County employees.

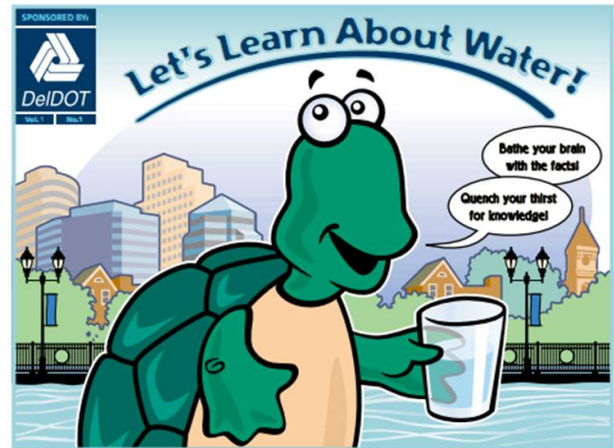


Figure 3. Stormwater Activity Book

Clean Water Begins and Ends with You

With the Partnership for the Delaware Estuary, DeIDOT hosts an annual stormwater drawing contest. Sixteen winners are selected and their drawings are compiled into a calendar. The first place winner's drawing is displayed on a DART First State bus and used as a public-education piece.

Dog Waste–Collection Program

With the Partnership for the Delaware Estuary and the Appoquinimink River Association, DeIDOT has developed a dog waste collection program to reduce the bacteria input to the Pike Creek watershed and multiple watersheds in the state. Activities related to implementing this program include the following:

- Purchase pet waste–bag dispensers (Dogipots).
- Conduct outreach and education effectiveness.
- Conduct microbiological monitoring.
- Produce and distribute a brochure/tipcards.
- Install dispensers in neighborhoods and New Castle County parks.
- Purchase pet-waste bags, “Bags on Board.”

Stormwater FYI Brochure

DeIDOT developed an outreach brochure describing stormwater-drain efforts, this was distributed to approximately 20,000 New Castle County residents and at venues including, but not limited to:

- Bear Glasgow Civic Council-Rutledge Community
- DNREC's Watershed Assessment Section for distribution at Peach Festival
- DNREC Nonpoint Source Program

Stormwater Display Board

In 2006 DeIDOT hired a graphic designer to create a new display, which includes ten placards, each depicting a water quality message. DeIDOT purchased a 10-foot poster display board, graphics, and a watershed model to be used at outreach events. It has been used at over 30 events from 2002-2011, including, but not limited to, the following events:

- Delaware State Fair
- Delaware Rural Water Association

- Harvest Moon Festival
- Delaware Water Festival
- University of Delaware Coast Day
- Earth Day events

Technology Students Association (TSA) State Conference

DelDOT staff have served as judges in the TSA State Conference (2002-2011). In 2002 as part of this event, students competed in the development of a children's coloring book and a restaurant placemat related to NPDES and water quality.

Educational Bookmark

With the Delaware Nature Society, DelDOT developed bookmarks for distribution to early education students (Figure 4). The bookmarks serve as a complement to the state-mandated Delaware-watershed curriculum and Delaware Nature Society programs where they were also distributed.

Articles

DelDOT staff have authored articles in publications such as Estuary News, DelDOT Dispatch, and the Nonpoint Education for Municipal Officials (NEMO) publication.

Stormwater-Education Presentations

DelDOT presents stormwater-education information to various groups, including:

- Pike Creek Civic Association
- Brandywine Rotary Club
- Camden-Wyoming Rotary Club

DSWA Brochure Distribution

DelDOT coordinates with the Delaware Solid Waste Authority (DSWA) to receive and distribute their "Household Hazardous Waste Collection" program brochure. The brochure is distributed at public events and educates citizens on the proper disposal of household hazardous materials.

Water Resources Agency

In 2010 through the Delaware Center for Transportation, DelDOT funded the University of Delaware's Water Resources Agency, a unit of the School of Public Policy & Administration's Institute for Public Administration, to investigate cost-effective social-marketing options that are feasible in Delaware to meet the minimum general public "impressions" required by the new NPDES Phase I permit. This project proposes to assist co-permittees in meeting the education requirements of the NPDES permit.



Figure 4. Stormwater Bookmark

Delaware Association for Environmental Education

DelDOT staff have been active participants in founding and developing the Delaware Association for Environmental Education (DAEE). The DelDOT Environmental Scientist serves on the Board of Directors, assists the group with its communication and outreach, and served on the planning committee for DAEE’s first annual statewide conference (February 2010).

Environmental-Education Consultant

Since 2002, DelDOT has hired an education consultant every year. For several years the Partnership for the Delaware Estuary served in this role, followed by the Appoquinimink River Association, and the University of Delaware’s Water Resources Agency. The role of this consultant has varied but in general it provides assistance related to meeting the education goals outlined in the NPDES permit.

Table 1. DelDOT Programs and Initiatives

Stormwater Website
Stormdrain Inventory and Marking
Tax Bill Insert
Doorhangers
Tipcards
Public Events
Anti-Litter Education Program
Book Covers
Media Outlets
Appoquinimink River Association
Adopt-A-Highway Program
Interactive Water-Quality Games
Watershed Clean-up
Activity Books and Placemats
Watershed Training Course
Clean Water Begins and Ends with You
Dog Waste–Collection Program
Stormwater FYI Brochure
Stormwater Display Board
Technology Students Association State Conference
Educational Bookmark
Articles
Stormwater-Education Presentations
DSWA Brochure Distribution
Water Resources Agency
Delaware Association for Environmental Education
Environmental Education Consultant

3.3 Stormwater-Education Programs in Delaware

There are numerous programs throughout Delaware with for curbing nonpoint-source pollution and reduce stormwater runoff. It is valuable to have an inventory of these programs in order to work in a coordinated fashion and avoid duplicating existing efforts. Understanding the existing programs also enables DelDOT and the co-permittees to work with these partners and enhance the existing programs and make more efficient use of resources. Many nonprofit organizations in Delaware, such as the Appoquinimink River Association, Delaware Nature Society, and the Partnership for the Delaware Estuary, have multiple stormwater-education programs that are implemented throughout the state. As such these organizations are valuable partners in this effort. In addition, there are many stormwater-education programs throughout the state that will enhance DelDOT and the co-permittees stormwater-education efforts in the future. A summary table of stormwater-education programs in Delaware is provided in Table 2 at the end of this section. The Appoquinimink River Association has also developed a valuable resource that inventories all pertinent nonpoint source programs and events in Delaware. The inventory, developed in 2007 at the request of DelDOT, focuses on nonpoint-source programs and events available and applicable for participation in Delaware. This survey brings focus to all the programs and events available and illustrates specific topics of programs and events of need that are absent. This publication, viewable at www.apporiver.org/projects/PastProjects/Projects_P_Stormwater_Materials_Survey.html, provides a comprehensive review of Delaware's stormwater-education programs. For the purposes of this report, a select group of stormwater-education programs, based on the newness of the program, comprehensiveness, and applicability to the NPDES permit requirements are discussed in more detail in this section.

Livable Lawns

The goal of Delaware Livable Lawns is simple—reduce fertilizer and pesticide runoff from lawns. This goal is achieved through extensive education that:

- Certifies lawn-care companies that follow environmentally friendly practices in fertilizer application while educating property owners.
- Provides homeowners with the necessary information to make small changes in their lawn-care practices so that they can be better stewards of the environment.

Educating applicators (homeowner and commercial) is the lynchpin to adopting a new approach to lawn care. Delaware Livable Lawns initiative is a partnership among the following organizations:

- DNREC's Division of Watershed Stewardship
- Department of Transportation's NPDES Program
- Department of Agriculture Nutrient Management Commission
- Delaware Grounds Management Association
- USDA's Natural Resource Conservation Service
- New Castle Conservation District
- Appoquinimink River Association
- University of Delaware's Water Resources Agency
- University of Delaware's Cooperative Extension
- Delaware Nature Society

The requirements for a lawn-care company to be certified as part of the Delaware Livable Lawns program are as follows (certification will be administered and managed by the Delaware Nursery & Landscape Association):

- Keep fertilizer and grass clippings off any impervious surfaces (for example, sidewalks and driveways).
- For all new accounts (individual lawns previously not treated), test the soil for phosphorus, potassium, and pH prior to application. For established accounts (individual lawns that have been treated within a year or are currently treating), test the soil once every three years to determine the specific needs of the lawn.
- Apply nutrients based on the requirements outlined in the program.
- Calibrate spreaders for correct application rates and record the pounds of nutrients applied to each lawn.
- Have a certified Commercial Nutrient Handler employed within the company.

Once certified, companies will receive recognition through free newspaper advertising, listings on the initiative's website (www.delawarelivablelawns.org), and other publications. Companies will have complimentary use of the program logo for their own marketing materials. They will receive free leave-behind educational materials, truck decals, and signage.

Property owners will be provided with the information they need to apply the right product, in the correct quantities, at the ideal time. By implementing these lawn-care practices, they can maintain their healthy, beautify lawns and partner in protecting the environment. Point-of-sale signage will be developed incorporating QR Codes (scannable codes used by smartphones) linking to the Delaware Livable Lawns website and other resources. Mobile applications for smartphones will be developed with the State of Delaware's assistance, giving property owners easy access to program information, a fertilizer calculator, and a listing of certified applicators. Doorhangers will be designed and produced that will feature fertilizer facts and tips.

The recently developed Delaware Livable Lawns website (www.delawarelivablelawns.org) provides a plethora of information to assist both commercial applicators and homeowners with product selection, calculations, application instructions, and soil sampling instructions. It also offers links to other resources, publications and videos.

City of Wilmington Green Jobs Program

The City of Wilmington's Green Jobs Program engages the city's youth (14-18 years old) by providing green-collar work opportunities. In this six-week program (25 hours/week), the youth earn minimum wage and participate in hands-on work experience and classroom environmental education that introduces them to environmental issues and careers. By participating in this program, Wilmington's youth can help to transform the city into a greener, cleaner, safer community while experiencing meaningful employment and education opportunities.

Projects the Green Jobs Program's interns participate in include

- Maintaining street and park trees throughout the city (watering, pruning, mulching)

- Labeling storm drains to prevent pollution
- Learning essential professional expertise (public speaking, resume writing)
- Carrying out outreach
- Installing rain gardens
- Removing invasive plant species
- Learning about environmental careers
- Discovering and working with GIS
- Exploring the city's water and wastewater systems
- Gardening in community gardens

The success of this project is dependent upon the host organizations and the partnerships formed within the Green Jobs Program. Project partners for the 2011 and 2012 programs:

- City of Wilmington, Department of Parks and Recreation
- City of Wilmington, Public Works Department
- Delaware Center for Horticulture
- Delaware Department of Natural Resources and Environmental Control (DNREC)
- Partnership for the Delaware Estuary
- University of Delaware's Water Resources Agency
- Urban Environmental Center
- The Challenge Program
- Delaware Nature Society

Delaware's Seventh-Grade Watershed Curriculum

The State of Delaware's Department of Education requires that all schools that are Science Coalition members teach a watershed unit as part of the seventh-grade science curriculum. This watershed curriculum was designed by the State Department of Education and covers key concepts of watersheds. This includes the impacts of stormwater runoff and sources of stormwater pollution.

White Clay Creek Watershed Management Committee

The White Clay Creek is one of only two National Wild and Scenic Rivers protected in its entirety. National Wild and Scenic River designation encourages the appropriate development of land that can coexist with the river. This federal designation helps to preserve watershed features that enhance water quality, natural resources, and the overall quality of life. This approach takes into account changing land uses and the effects they can have on river habitat.

The White Clay Creek Watershed Management Committee is made up of local citizens, representatives of conservation organizations and other interested parties, and delegates from state and local governments, including all 13 watershed municipalities. The National Park Service provides staff to help link the committee to other agencies and the public, and it also provides technical and financial support.

Together the National Park Service, Management Committee, and partner organizations work to implement the goals and objectives of the Management Plan:

- Improve and conserve water quality and water quantity.
- Conserve open space, woodlands, wetlands, and geologic features.
- Protect native plant and animal species.
- Preserve cultural, historical, and archaeological sites.
- Enhance outdoor-recreation opportunities.
- Encourage environmental education and watershed awareness.

In addition to the broad goals of the management plan listed above, the White Clay Creek Management Plan Coordinator has pledged assistance to DelDOT and the co-permittees in the following areas:

- Development of outreach and education programs and coordination/selection of stakeholders for educational activities and outreach
- Scheduling and conducting educational and outreach events, workshops, and seminars for stakeholders
- Development of a path forward pertaining to the evaluation of the programs and outreach to gage impressions

Each one of these programs discussed in detail above can be a useful program supplement in meeting the NPDES requirements. Each program has a captive audience and an established message related to reducing stormwater pollution. It would be to the benefit of DelDOT and the co-permittees to develop a partnership or maintain the existing partnership with these programs and those listed in Table 2.

Table 2. Stormwater-Education Programs in Delaware

Delaware Livable Lawns
City of Wilmington Green Jobs Program
Seventh Grade Watershed Curriculum
Christina River Watershed Cleanup
Delaware Department of Agriculture Education Programs
New Castle Conservation District Education Programs
DNREC Education Programs
Envirothon
White Clay Creek Watershed Management Committee
New Castle County Programs
Statewide Workshops and Seminars
City of Newark Community Habitat
Municipal and Local Government Programs
Appoquinimink River Association
• Water-friendly Interactive House
• Gardening for the Environment
• Townsend Community Habitats
• Water Education in the Classroom
Raingardens for the Bay
Delaware Nature Society

• Backyard Habitat
• Stream Watch
• Summer Camps
• Education Programs
Delaware Center for Horticulture
• Green Skills and Jobs Training
• Community Trees
• School Gardens
Partnership for the Delaware Estuary
• Art contest
• Schoolyard Habitat
• Stormdrain Marking
• Dog Waste Control
• CESP Program (Corporate & Community Environmental Stewardship Program)
• Teacher Training
Public Education and Outreach Events (specifically focused on water)
• Earth Day
• Creekfest
• Ag Day
• Coast Day
• “Make a Splash” Festival
DNREC’s Delaware National Estuarine Research Reserve
• TYDB (Thank You Delaware Bay)
• School Programs
• Community Programs
• Teacher Professional Development Training
Center for the Inland Bays
• Schoolyard Habitat
• James Farm Outdoor Education Program
• 1,000 Raingardens for the Inland Bays

3.4 Stormwater Public-Education Efforts Nationwide

Nationwide, state, county, and local governments and organizations have undertaken efforts to address the importance of controlling nonpoint-source pollution from stormwater runoff. Many of these programs seek to fulfill the education and outreach requirements of the NPDES permitting process, but have wide reaching benefits beyond simply meeting regulatory requirements. To effectively assess the nature of a representative sample of these programs, a Web survey was conducted to identify organizations that were actively developing and promoting outreach efforts. Based on assessment of the comprehensiveness of such programs, as well as their direct applicability to the NPDES permitting requirements, several program managers were contacted to further assess their nature, scope, and measured effectiveness.

The intent of this analysis was not to perform an exhaustive national search but to take a sampling of programs from which lessons and information could be gleaned. The programs focused on in this section include those that are considered comparable to DelDOT's in terms of scope and scale, have a presence on the Web, and we were able to make contact and discuss the programs. There were several programs that are not included in this analysis because we were unable to make contact or the information was not available or current via the web or through contact with the organization.

A review of some of these programs follows. Entries with an asterisk (*) were based primarily on telephone interviews. The questions posed to the organization's contact are provided in Appendix B.

3.4.1 Programs Through State Departments of Transportation

Maryland State Highway Administration*

The Maryland State Highway Administration (SHA) is currently operating under an NPDES permit that has a stormwater-education requirement. The formal program has largely been limited to an Earth Day conference but there have been other programs which SHA has been involved in::

- Adopt-a-Highway, which seeks to limit litter.
 - Highway plantings: SHA administers the Federal Transportation Fund to create a Transportation Enhancement Program (TEP). Under this program funding, is distributed to counties and municipalities to support environmental programs.
- The SHA has partnered in the "Maryland Bay Game," a summer activity for kids to play while in the car.

Program effectiveness has never been investigated. The Maryland SHA does not have a formal way of measuring success, other than quantifying the amount of money spent on stormwater-education programs. To date, the SHA has not received feedback from the public.

California Department of Transportation (Caltrans)

Caltrans has implemented several programs and used several tools to reduce nonpoint source pollution, including:

- The "Don't Trash California" campaign, which aims to discourage citizens from littering the roadways.
- Using mass media, hosting special events, and reaching out to communities to spread the message, the following mediums have been used:
 - Radio (30- and 60-second spots) and 30-second television ads
 - Highway billboards
 - Theater slides
 - Trash can wraps
 - Online advertising

Connecticut Department of Transportation (ConnDOT)

ConnDOT's Stormwater Management Plan includes public education and outreach. ConnDOT uses brochures, posters at bus and train stations, public service announcements for radio, television, and print,

storm-drain markers, and tributary signage (e.g., “entering public drinking water protection area”) to distribute the stormwater-education message.

Texas Department of Transportation “Don’t Mess with Texas” Anti-litter Campaign

Since 1985, the Texas Department of Transportation (TxDOT) has sponsored the “Don’t Mess with Texas” campaign to educate the public and fight litter on state roads. This effort has proven to be one of the nation’s most highly recognized, longest running, and most successful efforts at using outreach to affect behavior. Beyond a beautification campaign, effective litter reduction can save money on highway maintenance and reduce the volume of floatables and other debris that get into the stormwater system. By tapping into the existing image of Texas as a proud and independent state, the marketing campaign was able to reach a very wide audience. The primary motto of the program (“Don’t Mess with Texas”) is a federally registered trademark. The phrase has proven so popular that it is often used without permission, requiring TxDOT to periodically take legal action to maintain its “ownership” of the brand.

Some salient features of the program:

- Highly interactive website including children’s games
- Partnerships with major private entities such as McDonald’s, Southwest Airlines, and Coca Cola
- Merchandising efforts such as provision of free bumper stickers, decals, and trashbags to Texas residents
- Electronic media including desktop icons, e-cards, and smart-phone applications
- A Facebook group with over 14,000 followers
- Community programs such as Adopt-a-Highway, photo contests, annual competitive clean-up days (“Trash-Off”)
- School-based programs around anti-litter education
- Scholarships for high school seniors sponsored by the program
- Celebrity endorsements including from Willie Nelson, Stevie Ray Vaughn, Lee Ann Womack
- Long-running research efforts to assess the types and amount of litter on the roads as well as surveys of public attitudes and behaviors to monitor the effectiveness of the campaign

This program is a model for other, similar programs. Its success can be attributed at least in part to its narrow focus, use of excellent marketing tools, emphasis on partnerships and community buy-in, and use of research tools to measure efficacy.

3.4.2 Municipal, County, and Regional Programs

Washington, D.C.

Washington, D.C., has implemented programs on stormwater-education in schools, including teacher training. They have supported environmental/conservation programs, including Project Learning Tree, Water Education for Teachers (WET), Project WILD, Pollution Prevention (P2), and Schoolyard Habitats.

City of Los Angeles

The City of Los Angeles hosts a comprehensive stormwater-education website targeted at meeting NPDES permitting requirements. Materials and programs highlighted on the website include:

- Distributable materials such as brochures, magnets, posters, and a refrigerator dry-erase board with stormwater facts and important phone numbers/contacts (for instance, see Figure 5 showing a storm-drain medallion)
- “Adopt-a-Beach School Assembly Program”
 - The city sponsors 45-minute school assemblies for elementary schools. The assembly topics cover the stormwater/stormdrain system and how it relates to the city and beach, how recycling promotes healthy stormwater, and how each student can make a difference by not littering and passing along the message to family and friends. The city also shows a slideshow explaining how pollution harms plants and animals.
 - Before the assembly, teachers are encouraged to participate in a workshop. The teachers are given a review of what will be taught during the assembly and are supplied with in-classroom activities to use before and after the assembly.

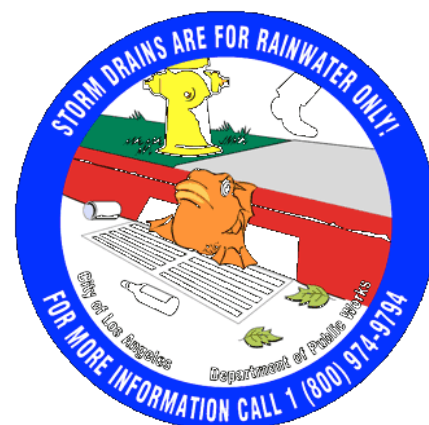


Figure 5. City of Los Angeles Storm-drain Medallion

City of Chesapeake, Va.*

The City of Chesapeake has implemented several programs to increase stormwater awareness under the Virginia Stormwater Management Program. Most efforts were not undertaken specifically to meet the requirement of the NPDES permits, but more specifically to meet the regulation’s education and outreach provisions. Some of the efforts include

- Education programs: Education programs in schools in which technicians are sent to schools for 40-minute sessions as part of a third-grade science class. The program is not directly related to managing stormwater, but is about educating children about the importance of soil, water, and the environment. The program considers reaching a young audience a very important component of public education. The program reaches 1,200 students a year over the course of 2½ months, with the average class size around 20-25 students. It is important to note that there are more classrooms requesting the program than the program is capable of visiting.
 - To implement a similar program, it is suggested that a science coordinator be identified who will serve as a liaison between the program and the teachers at the schools. This coordinator would maintain contact with teachers and work out the logistics of setting up the program at the schools, a step that is critical but often difficult.
- Adopt-a-Highway program: This program has grown in the past few years, and 70 active groups are currently participating in it. The effort is focused on decreasing ditch litter.
- Portable ashtrays: This program provides portable ashtrays that fit in the cup holder of a car. They are marketed at city events, and are intended to keep cigarette filters out of the storm sewer system.

- Distributable materials include drain markers, bill inserts, and printed ads designed by elementary and middle school students.

Seattle, Wash., Public Utilities*

In Seattle, public education programs were implemented to meet NPDES permit requirements. One area in particular that needed attention was automotive maintenance and runoff related to car washes.

- Three specific BMP programs have been implemented:
 - Car-wash program
 - Pet-waste program
 - Automotive-maintenance program
- The City actively identifies the target audience and seeks them out.
- The City is developing a survey to determine if the target audience has received the message. The city is not required to meet a set number of impressions, but it does have to measure behavior change.

Baltimore County, Md.*

Baltimore County has implemented several programs to address stormwater and NPDES permitting issues. The County has developed a set of standards that it notes are more restrictive than what is required by the EPA. Significant programs implemented include:

- Maryland Green Schools Program: the statewide nonprofit Maryland Association for Environmental and Outdoor Education works towards teaching schools and ideally has them implement BMPs. In addition to implementing BMPs, it is the hope that the schools will work stormwater education and water conservation into the curriculum. The goal is that schools will make connections to each student's watershed and will educate them about the watershed, specifically about water conservation and stormwater-pollution prevention.
- Storm drain-stenciling program: the County at one time coordinated efforts to stencil drain markers but found that these had to be reapplied every few years. Currently plastic disks are affixed with glue. The markers inform readers that water entering the drain flows directly to a stream, not a treatment plant.
- Community events: Representatives from Baltimore County attend various community events where they assist local watershed groups in educating the public, for instance handing out brochures and other educational material.

Gwinnett County, Ga.*

Stormwater-education programs are implemented to meet NPDES requirements and requirements set by the Metropolitan North Georgia Water Planning District. The county is currently in the process of creating a stormwater-education plan, and the goal is to be proactive, rather than reactive, to problems. To fulfill this goal, the county has initiated several programs and events:

- Six distinct workshops are held throughout the year. The County advertises and organizes the workshops and invites outside presenters to speak on various topics. The workshops are broadcast on local government-access TV. Workshop topic areas include:
 - Septic-tank maintenance (presented two times/year)
 - Detention-pond maintenance

- Fall gardening/composting
- Rain gardens
- Spring cleaning/waste management
- Lawn-care/integrated pest management (Gwinnett County Cooperative Extension, in collaboration with the University of Georgia, makes this presentation)
- Brochures have been created by both the county and the Clean Water Campaign for various workshops, for example:
 - Gardening/lawn care for both the public and the lawn-care industry
 - Auto repair
 - “Clean Water Begins with You” and “When it Rains, It Drains”
- The Stormwater Department consistently has at least one article in the “County Connections” newsletter on subjects such as watershed health or the adopt-a-stream program. The newsletter is inserted into the water bills.
 - Requests are made for contributions to the internal county newsletter and education on the county’s efforts and goals.
- The County hosts an essay contest in conjunction with the Metropolitan North Georgia Water Planning District.
 - All jurisdictions were welcome to participate.
 - The Stormwater Department presents an award at the winner’s school.
- Radio announcements have been developed, for which there has been positive public feedback.
- Stormwater Department personnel conduct “tours” to senior centers and community centers to talk about their activities and aims.

The County relies on the Planning District to gauge public awareness and program effectiveness.

Metropolitan North Georgia Water Planning District/Clean Water Campaign

The Metropolitan Water District’s campaign is different from many other programs around the country because it covers a region, not just one government or municipality. There are over 100 local governments that make up the district. The local governments pay dues, and in return the Clean Water Campaign, which is the outreach effort in the district, helps the co-permittees meet the public-education requirements of the municipalities’ MS4 permits. The District provides brochures and other materials to the municipalities, and the municipalities hand them out to schools or communities at various events.

Each local government must meet the NPDES permit’s number of impressions criteria as administered by the Georgia Environmental Protection Division. The Water District conducts a regional telephone poll to assess how effectively it reaches the residents. Efforts include:

- Three primary areas of outreach: public-awareness campaigns, outreach and education to key target groups, and primary and secondary education.
- The public-awareness campaign has included ads on cable television and radio, highway billboards, press releases, bus-stop signage, utility-bill inserts, and websites.
- In 2010 the District conducted an essay contest titled “Water—Use it Wisely.”

More specific information on particular programs is maintained by the individual member localities.

Chapter 4 – Workshop Overview/Lessons Learned

4.1 Workshop Overview

On September 28, 2011, WRA hosted a workshop to discuss stormwater education and public outreach. This workshop specifically involved discussion of tools and methods to meet the stormwater-education requirements of the NPDES permit. The workshop was funded through an award from the Delaware Center for Transportation (DCT).

This workshop was an interactive approach to educate the participants about the tools that are available to help meet the public education and outreach requirements in the NPDES permit. There were 18 participants from a variety of organizations, including DeIDOT, New Castle County, the City of Wilmington, Delaware City, the Town of Elsmere, the Town of Middletown, the University of Delaware, and the White Clay Wild and Scenic Management Committee. Eric Eckyl (of Water Words That Work, LLC) led the workshop. Names and affiliated organizations of the workshop attendees are included in Appendix C.

The workshop participants learned about several essential components of marketing and educating the public about specific topics that relate directly to the stormwater goals of the permit. Eckyl discussed the importance of creating a focused message and targeting a specific audience or group with this message. Eckyl discussed a multitude of available information sources about the audience one is targeting. For example, he provided statistics on the population of New Castle County, one specific area in which the outreach and education campaign will be focusing. Eckyl noted that according to the 2010 U.S. Census, New Castle County's population is 538,479, it is 66 percent white, and the demographic information of those who are age 25 and older is as follows:

- 32% have earned a four-year degree or higher.
- 88% have a high school degree or higher.
- 12% did not complete high school.
- Per capita income is \$31,071.
- Home ownership rate is 71%.
- 10% live below the poverty level.

Each of these factors is critical in developing a campaign that will reach and be meaningful to the residents in New Castle County. This type of information was also provided for the state of Delaware, City of Newark, and Town of Middletown.

In addition to knowing one's target audience, Eckyl discussed the importance of making a "real" impression and changing behavior based on the message one develops. For example, how many people had read the newspaper ad or heard the commercial and then volunteered at the event or signed the pollution-prevention pledge? Moving people to act based on an ad or commercial or some other marketing tool is critical to getting the message out and achieving a successful education and outreach campaign.

4.2 Workshop Recommendations and Lessons Learned

As discussed in Section 4.1, the workshop held on September 28th discussed tools that are available to help meet the public education and outreach requirements in the NPDES permit. At the workshop, Eric Eckyl provided expertise on critical concepts that must be considered when developing an education campaign to meet the NPDES requirements. This section briefly summarizes these concepts discussed.

Know Your Target Audience

The take-home advice is that most messages should go to a very limited interest group. Precision in a message is important. The universe of interested/affected parties (the target) is typically very small in comparison to the general population receiving the message. Focusing on a targeted group saves money and effort. Outreach efforts that are “big & sloppy,” such as newspaper ads and PSAs may reach a wide audience, but if the topic only pertains to a select group of people it is a wasted effort. Use a targeted approach to minimize collateral/non-target audiences. Targeting a specific audience requires forethought to define the target group.

Use New Data and Web Tools to Focus on Your Target Audience

Fortunately, many Web-based tools and powerful data sources are available to assist in refining the target audience. For example, readily available U.S. Census information, Agricultural Census data, Bureau of Labor Statistics, offer information such as per capita income, homeownership rates, vehicle ownership, education levels, race, etc., all of which might guide where marketing should occur. Facebook provides powerful tools to assess individuals’ particular political leanings, environmental interest, hobbies, etc. With these tools, it is possible at no cost to determine the number of users that fit a particular profile. To distribute messages to your target audience, ad space can be purchased that is charged on a per-click basis, so that the only messages that incur a cost are those that are actively sought. Google also provides similar tools to help refine the target audience and message. Private marketers can also be retained to assist in refining methods for most effectively finding your audience.

Ensure Effective Design (i.e., Marketing Aspect)

Once a target population is identified, it is important to be aware of the types of marketing strategies that will be effective based on the known demographics and interest areas of your audience. Be aware that different approaches will be necessary based on the audience, the medium used, and the message itself. Retaining the services of professional graphics or advertising agencies can be a worthwhile investment.

Be Aware of “The Slope”

Once a marketing strategy is developed for your target audience, it is important to understand the need to ensure that the message is not simply heard but is likely to affect behavior. Eric Eckyl has described a four-step process that a message undergoes, which he calls “The Slope”:

1. Impression – The message is made public.
2. Conversion – The audience is aware of the message, and responds in some way.

3. Retention/Cultivation – For audience members who have become aware of the message and follow-up (e.g., by visiting a website or making contact), this relationship is encouraged and a next step presented.
4. Commitment – The individual message recipients take positive action based on the intent of the message. Ideally, there is lasting behavior change on the part of the individual.

Cost/Benefit

Since it might be deemed that different campaign tactics are appropriate in different situations, a close consideration of the costs involved compared to the expected outcome is paramount. For example, a low-cost campaign that does not have a high “conversion rate,” might be less cost-effective than a much higher-priced effort that reaches fewer people but changes their behavior.

Leverage Existing Resources

- Identify key organizations and individuals – There are many people and groups across Delaware working to reduce the effects of stormwater runoff. Establishing contact with these groups and their activities is one of the most effective means to reach the widest group of people with the least effort. For instance, a list of associations working in the field of water resources in Delaware is contained in Appendix D.
- Coordinate the message – By working closely with these groups, a unified message on particular topics can be coordinated across disparate groups. DelDOT is in a unique position to provide this type of leadership and coordination.
- Leverage existing programs – Many groups (towns/townships/watershed teams, etc.) have well-developed campaigns. The effective approach to foster these activities might often be to participate materially (through in-kind service or direct funding).
- Maintain contact lists – An up-to-date list of contacts is vital to retain communication with these groups as well as a wider target audience. This can be achieved in a variety of ways, either by maintaining spreadsheets in-house, or by using software and services that provide powerful tools for maintaining and contacting your audience. Careful maintenance and culling of these lists is important.

Survey

Evaluation of effectiveness requires a survey of the population. There are two basic approaches that differ in level of effort and effectiveness at gauging the success of the stormwater-education efforts.

- Population survey – To see how widely your message is being disseminated in the public’s perception, large-scale survey methods must be used. This involves retaining the services of a marketing research group with experience conducting large-scale, statistically valid surveys (such as the University of Delaware’s Center for Applied Demography & Survey Research). This needs to be performed before the message is disseminated and within 18 months of the date of the permit. A second survey will need to be conducted beginning within approximately 3.5 years of the permit (two years after the survey).
- Group survey – A cost-effective way to gauge the effectiveness of specific messages is to conduct a survey on a targeted group getting a specific message, for instance, by administering a

survey before and after a stormwater workshop, stream cleanup, or other stormwater-related activity.

Chapter 5 – Stormwater-Education Recommendations

5.1 Stormwater Recommendations by Target Area

In order to meet the requirements of the Phase I NPDES permit the education and outreach campaign must focus on specific areas related to stormwater pollution. According to the permit, these include the following:

1. Public reporting of the presence of illicit discharges or improper disposal of materials
2. Proper management and disposal of used motor vehicle fluids and household hazardous wastes
3. Proper management and disposal of grass clippings, leaf litter and domestic animal wastes
4. Proper use of water to limit excess non-stormwater water discharges from activities such as washing cars and lawn irrigation, from entering the storm sewer system
5. Proper use, application, and disposal of pesticides, herbicides, and fertilizers by commercial and private applicators and distributors
6. Public participation events, such as stream clean-ups, drain stenciling, etc.
7. Proper maintenance of BMPs directed toward private and commercial property owners, and state or municipal entities responsible for maintenance
8. Opportunities for residential installation of LID practices, and the use of Green Technology BMPs that reduce runoff and mimic natural hydrology

This chapter provides a detailed approach for each one of the Target Areas listed above. Each approach specifically addresses the following categories:

- Goal
- Target Audience
- Recommended Approach
- Targeted Scale of Impressions (high, medium, low)¹
- Cost (high, low)²

The recommended approach for each Target Area includes a variety of tools that will be effective in reaching the target audiences in order to change a specific behavior related to stormwater education. Existing resources and programs, such as those discussed in Chapter 3 and concepts learned at the workshop, laid out in Chapter 4, are used to develop the recommended approach for each Target Area.

¹The targeted scale of impressions is a general estimate of the magnitude of individual impressions that should be made to reach the target population with the recommended approach. In general, educational campaigns targeted at a wider audience will have a higher value.

²Based on the recommendations the cost category reflects the magnitude of the time and money for implementing the recommendations.

TARGET AREA 1

Illicit Discharges (Public Reporting)

Goal

Public reporting of incidents of illicit discharges or improper disposal of materials, including floatables into the storm-sewer system.

Target Audience

Businesses and the public at large

Recommended Approach

Illicit discharges are defined by the EPA for the purposes of NPDES permitting as “any discharge to a municipal separate storm sewer that is not composed entirely of stormwater.” The nature of these discharges can be quite varied, and they include intentional routing of waste products, including sanitary-sewer outflow, wash water, or industrial waste products, to the storm-sewer system, unintentional spills or incidental runoff from industrial or other facilities, and intentional, episodic releases (so-called “midnight dumping”). Illicit discharges typically come from businesses or individuals. Incidents from businesses (particularly those that deal with large amounts of hazardous waste, such as automotive facilities or industrial processing operations) tend to be more persistent, while incidents from individual citizens are far more intermittent and widely dispersed.

Illicit discharges can introduce toxics, pathogens, nutrients, surfactants, and floatable debris into the stormwater system, ultimately degrading overall water quality. The effects can be quite large, especially since these discharges create dry-weather flow, so that concentrations, in the absence of high flows that dilute pollutants, are relatively higher.

DelDOT has applied considerable focus both to the detection and amelioration of illicit discharges and their effects, as well as campaigns to educate the public on the importance of reporting incidents that threaten the waters of the state, including:

1. Monitoring and inventory of outfall locations with indications of discharges (e.g., dry-weather flow, presence of detritus, oil sheens, odors, etc.). A complete inventory of all such outfalls and presence of evidence of illicit discharges was completed in 2007.
2. Door hangers passed out to homes in the vicinity of an illicit discharge or illegal dumping incident. The front side of the door hanger lists the pollutant found, and the back provides information about stormwater pollution and suggestions on how the homeowners can help minimize the problem. This is an important effort because it educates citizens on how to come to become aware of potential problems in the future.
3. Storm-drain markers with the phrase “only rain down the drain” placed on storm drains, which provide a cohesive visual reminder that the storm sewer system is an interconnected network that leads to Delaware waterways.

4. Participation in and support of public outreach such as presentations to civic groups and Adopt-a-Highway programs.
5. Online reporting form for problems with stormwater system (e.g., clogs, illicit discharges, etc.). This link, while combined with reporting for other DelDOT issues such as road conditions, is an easy way to connect with the public and enhance feedback and responsiveness.

Such efforts should be continued and enhanced. The existing website offers a comprehensive overview of these programs as well as educational and other material for distribution. Identifying problem areas and educating the sectors and individuals who help prevent or report illicit discharges will serve to reduce the overall costs for stormwater control, particularly by reducing the need for extensive retrofits.

Using data collected and maintained by DelDOT and its contractors on the location and nature of problem areas (i.e., “hot-spots” of discharge activity and dry-weather flows), DelDOT can develop a prioritized strategy for developing educational campaigns. Targets should include both the likely producers of illicit discharges as well as the public at large. Education should focus on the importance of protecting the stormwater system from discharges, as well as on encouraging the citizenry to be vigilant about potential problems.

Emphasis should be in areas where past or potential future violations can occur and can include training on the signs of illicit discharges and the avenues for reporting incidents. Institutional groups, and schools in particular, are an important target group, since they represent potential violators as well as a pool of individuals who can help monitor violations. Using innovative technology to help individuals report incidents, such as a smartphone app, will also make it easier for individuals to feel empowered. Convincing the people who might potentially pollute or report incidents that there is a shared responsibility will help effectively address this problem. Education efforts should help individuals realize that they can make a difference and that small improvements can cumulatively make a big difference.

The value of vigilance for the common good should be emphasized. The point that this is a public health issue, and one that disproportionately affects vulnerable populations such as children and the elderly, can increase awareness and the likelihood of reportage. Focus should be on areas of high population density and stable demographics near “hot-spots.”

The economic argument for stopping illicit discharges includes the fact that clean water encourages businesses development, lowers costs of cleanup, enhances recreation and recreation-related economic activities, increases property values, and fosters the desirability of an area as a place to live.

Targeted Scale of Impressions (high, medium, low)

High

Cost (high, medium, low)

Medium

TARGET AREA 2

Used Motor-Vehicle Oil and Household Hazardous Waste

Goal

Keep oil and hazardous waste produced by individuals/citizens out of the water bodies and stormwater system.

Target Audience

Homeowners, vehicle owners, business owners

Recommended Approach

These pollutants become a problem through intentional and unintentional introduction of oil and household hazardous wastes (paints, solvents, poisons, etc.) into stormdrains, improper vehicle maintenance resulting in leaked fluids that get washed into drains and waterways, and improper handling or disposal of solid waste (e.g., household electronics) that can leach hazardous materials such as mercury into the stormwater system.

In order to effectively educate the public about minimizing this risk, a wide-ranging approach is most effective, since its source can come from a broad range of people and activities. To achieve this broad effect, it is advisable to leverage existing information and programs. In fact, there are already many existing websites, fact sheets and other educational material that adequately cover the issues and recommended solutions to mitigate this type of environmental pollutant.

DNREC, New Castle County Conservation District, Partnership for the Delaware Estuary, Delaware Solid Waste Authority, and many MS4 municipalities, among other groups, provide a wide range of information addressing these issues. Materials already available on DeIDOT's Stormwater Quality website (deldot.gov/stormwater) address ways to keep oil and household hazardous wastes out of the storm-sewer system. These materials address a wide range of audiences and are distributable through many means.

To make the best use of existing resources to meet the NPDES permitting requirements for education and outreach, DeIDOT, as a primary permittee, can act as a coordinator for the many valuable resources produced by other agencies and organizations. Developing and maintaining communication channels with and among these stakeholder groups ensures that the messages are coordinated, complementary, and can thus be most effective.

In particular, DeIDOT should focus on the activities of their co-permittees, such as MS4 municipalities, many of which have developed education and outreach materials and programs, yet which might not have the resources to most effectively produce, implement, and distribute them adequately. One common approach many communities have taken to increase awareness about the dangers of dumping hazardous materials into the storm drain system is affixing stormwater medallions to intakes. These can be effective deterrents to illicit or unintentional introduction of hazardous materials but require an initial financial outlay and ongoing maintenance. DeIDOT could assist smaller MS4 communities in such

simple, yet effective, programs, for instance, by helping defray costs, assisting with the standardization of medallion design and application methods, and developing a maintenance strategy.

DelDOT can serve as the centralized “umbrella” organization to the implementation of stormwater marking (or other) efforts. Direct education and outreach about the medallions and storm drain–marking efforts can be achieved through newspaper articles, PSAs, billboard ads, bus-stop posters and other media. In this way, a variety of separate but similar initiatives can be presented under a unified outreach campaign.

Similarly, DelDOT can help coordinate other efforts related to educating the public about oil and hazardous household–waste disposal. Importantly, by maintaining contacts with and among stakeholders, DelDOT can respond specifically to the individual needs of the co-permittees and provide material support and guidance to a wide range of efforts aimed at a broad cross-section of the public.

Targeted Scale of Impressions (high, medium, low)

Medium

Cost (high, medium, low)

Low

TARGET AREA 3

Yard and Pet Waste

Goal

To encourage the proper disposal of potential pollutants, including yard and domestic pet waste.

Target Audience

Homeowners and pet owners (children and adults)

Recommended Approach

It is recommended that yard- and pet-waste-reduction programs be addressed separately. These sources of pollution come from two distinct target audiences, and the approach would be most effective with campaigns targeting each behavior separately. As a starting point though, for both of these Target Areas, it is critical to inventory and assess the existing yard- and pet-waste-reduction programs in Delaware.

Yard Waste

Yard debris (grass clippings, plant matter, and tree and shrub trimmings) can be a significant source of stormwater pollution. Decomposing vegetative matter leaches excess nutrients. Excess yard waste and debris can clog culverts, storm drains, and pipes, resulting in flooding. Overall, it is a best practice to compost yard waste or dispose of yard waste via a public or private utility.

Since the yard-waste ban has taken effect in New Castle County, there have been several resources developed to educate homeowners about the best ways to dispose of yard waste. Websites, such as DNREC and the University of Delaware's Cooperative Extension, provide links to private and public drop-off locations and utilities that will dispose of your yard waste, as well as tips and tools for composting and disposing of your yard waste onsite. It is recommended that DelDOT and the co-permittees develop strategies to disseminate the existing educational material and information more effectively.

Pet Waste

When pet waste is left on the ground, rain and snowmelt wash this and the associated bacteria into storm drains and directly into local rivers and streams. There are several existing pet waste programs in Delaware. One of the most publicized programs is the Partnership for the Delaware Estuary's Dog Waste Control Program. This program reaches out to pet owners and communities to help reduce the negative impacts of pet waste by providing the necessary tools to handle it. This program provides signage templates, supplier information, and tip-card templates and solutions. It would be most effective if DelDOT and the co-permittees worked through the existing pet waste-control programs and provided funding support to make the program more well known and to get it into more communities throughout Delaware. By working through established programs like the Partnership for the Delaware Estuary's Dog Waste Control Program, DelDOT and the co-permittees would have a greater impact in carrying out its message.

In many homes, children play a major role in pet care; therefore, children are a critical target audience for a message. So, in addition to partnering with existing programs, the pet-waste campaign should be brought to schools where possible. As discussed in Chapter 3, several groups have school programs that target children with a specific stormwater message (Baltimore County, Md., City of Chesapeake, Va., and Gwinnett County, Ga.). For example, the City of Chesapeake, Va., has implemented education programs in schools in which technicians are sent to schools for 40-minute sessions as part of a third-grade science class. The program considers reaching a young audience a very important component of public education. The program reaches 1,200 students a year over the course of 2½ months. A program similar to this, yet with a focus on reducing pet waste, could be conducted in schools in New Castle County. This issue could also be incorporated into Delaware's seventh-grade Watershed Curriculum, which requires that all schools that are Science Coalition Members teach a watershed unit as part of the seventh-grade science curriculum. DelDOT also has a number of resources that have been used to educate students in the past, including activity books and bookmarks. These publications could be slightly altered to include information on the negative impacts of pet waste. Finally, one other method to reach young people is through the Green Jobs program. Within this program, which includes approximately 10 interns and during the six-week program, there could be a day dedicated to disseminating outreach material related to reducing pet waste. This would be an effective way of reaching the general public with this message as well as educating the Green Jobs interns during the process.

Targeted Scale of Impressions (high, medium, low)

Medium

Cost (high, medium, low)

Low

TARGET AREA 4

Lawn Irrigation/Car Washing

Goal

Reduce the amount of runoff entering the storm sewer system from irrigation of lawns and washing of cars on impervious surfaces.

Target Audience

Homeowners, vehicle owners

Recommended Approach

Runoff from residential lawn irrigation and the washing of cars represents a significant source of pollution to the stormwater system. While the nature of nonpoint source pollution such as runoff from residential water use makes the direct effects difficult to quantify, a best practices approach, using fairly simple and low-cost techniques will improve both the quality as well as reduce the quantity of water entering the stormwater system. DelDOT is already involved with a variety of programs that address these issues, such as the Delaware Livable Lawns initiative discussed in Chapter 3. DelDOT's stormwater website also has a variety of information on creating lower-impact lawns for homeowners and tips to reduce the loads on the storm sewer system and on water quality from washing cars.

Lawn Irrigation

The issue of limiting the watering of residential lawns to reduce the amount of runoff and associated pollutants that enter the system fits into a larger scheme of coordinated landscaping strategies which seek to mitigate the effects of pesticides, herbicides, and nutrients (fertilizers) applied to lawns and outdoor landscaping. The Delaware Livable Lawns program takes a comprehensive approach to this issue. Other programs, such as rain barrel promotions (by DNREC and many municipalities), Backyard Habitat designation (e.g., by the Delaware Nature Society), programs that promote native plants and healthy habitat (e.g., the Brandywine Valley Association's BasinScapes program) address a broad range of ways to reduce the harmful impacts of residential landscapes.

Strategies to address the problems of lawn irrigation, therefore, can best be developed within the framework of these broader initiatives. Coordination with stakeholder groups (such as local NGOs and Tributary Action Teams) as well as co-permittees is critical. Working with water purveyors and groups such as the Delaware Rural Water Association can be effective for developing strategies to reduce the application of irrigation water.

Since water use for irrigation of lawns is most intensive in the first few years after residential development occurs, dropping off sharply after that, emphasis should be placed on areas of most recent development. Approaches that educate about fertilizer and pesticide application (e.g., home-improvement stores) should be coupled with educational materials about proper water use and the handling of runoff (e.g., the use of rain barrels to capture, then reapply roof runoff, or the disconnection of downspouts from driveways and hardened surfaces).

Car washing

Car washing is a significant and often under-appreciated source of contaminants entering the stormwater system. The EPA estimates that perhaps 60 percent of U.S. households wash cars at home on a regular basis. Improper washing habits, including parking on a hardened surface with direct runoff to a storm drain, using non-biodegradable cleaning solutions, and over use of water (for example if the hose used lacks a shutoff nozzle), lead to the introduction of surfactants, metals, and hydrocarbons into the stormwater system. A barrier to reducing the effects of this is the lack of understanding polluting effects of this activity; people are often under the mistaken impression that the activity is innocuous from a water-quality perspective.

Education campaigns, therefore, are essential, but they can be very effective, since the solutions to the problem are relatively simple. The EPA recommends approaches such as using a commercial car-wash facility (automated or self-serve), which are required to properly handle their runoff, parking on permeable surfaces (gravel or grass), using eco-friendly cleaning products, and keeping rinse water to a minimum.

Typically, information about car washing is promulgated to the public through broader education campaigns (such as educational posters on how to reduce environmental impacts around the home). Targeted approaches that address car washing to a narrower audience could also be effective. Brochures or other outreach at auto-supply stores would target the automotive “do-it-yourself” population. Another concentrated source of car-washing activity stems from charity fundraiser groups who host carwashes, often at local gas stations or other business establishments. Concentrating on the groups that host the fundraisers and on the businesses where they operate is an effective way to efficiently reduce impacts. Since these ad-hoc car-wash fundraisers are often run by student groups, the opportunity for effective education is enhanced.

Targeted Scale of Impressions (high, medium, low)

Medium

Cost (high, medium, low)

Medium

TARGET AREA 5

Lawn Care

Goal

Reduce herbicide, pesticide, and fertilizer use.

Target Audience

Homeowners, homeowner associations, golf courses, office parks, institutional entities with open space holdings, commercial and private applicators, and distributors of lawn care products

Recommended Approach

This issue has been a long-standing threat to the water quality in Delaware. The excessive use and misapplication of pesticides and fertilizer on residential and commercial properties results in increased toxins and nutrient loads in stormwater that runs off directly to the waterways.

In Delaware there is a group of nonprofit, state, and private stakeholders working together on this very issue. The goal of the Delaware Livable Lawns program is to reduce pesticide and fertilizer runoff from lawns. More specifically the Delaware Livable Lawns program aims to do the following:

- Certify lawn-care companies that follow environmentally friendly practices in fertilizer application.
- Provide homeowners with the necessary information to make small changes in lawn care practices so we can all be better stewards of our environment.

The most effective approach to achieving the goal set forth in the NPDES permit is for DelDOT and the co-permittees to participate in this partnership and fund specific efforts of this group, so that it can achieve the program goals.

DelDOT provided initial funding for this program, and it is supported by the efforts of many partners.

The Delaware Livable Lawns Program Advisory Group includes:

- Delaware Department of Transportation (DelDOT)
- Delaware Department of Natural Resources & Environmental Control
- Appoquinimink River Association
- Delaware Department of Agriculture Nutrient Management Commission
- New Castle Conservation District
- U.S. Department of Agriculture Natural Resources Conservation Service
- University of Delaware Water Resources Agency
- University of Delaware Cooperative Extension
- Delaware Grounds Management Association
- Delaware Nursery & Landscape Association
- Delaware Nature Society

Delaware Livable Lawns has currently undertaken the following efforts:

- Advocate for reduced pesticides and fertilizer in stormwater runoff.
- Develop and produce outreach materials (including brochures, magnets, store signs, etc.).

- Produce educational video.
- Held information session and workshop for commercial applicators.
- Develop a website.

This program will need additional funding to sustain and grow it as needed throughout the state of Delaware, and this is a critical role that the NPDES co-permittees can play in achieving the goals of this Target Area of the NPDES permit.

Targeted Scale of Impressions (high, medium, low)

Medium

Cost (high, medium, low)

Low

TARGET AREA 6

Public Participation Events/Stream Clean-Ups

Goal

To encourage the general public's participation in stormwater-related public events (such as stream clean-ups and workshops).

Target Audience

The public at large

Recommended Approach

There are many public events related to pollution prevention, and specifically curbing stormwater pollution, throughout Delaware. Developing new public participation events and stream clean ups are not necessary, but conducting an inventory of and coordinating with existing events is the most effective approach for this Target Area.

As discussed in Chapter 4, nationally and locally, many state agencies and local groups host and participate in public outreach activities related to stormwater pollution (e.g., public lectures, workshops, and stream clean ups). It is critical that information about events related to stormwater pollution (e.g., DE AWRA symposia, University of Delaware lectures, nonprofit lecture series, stream clean-ups, etc.) is disseminated and highlighted. For these events, it is essential that DelDOT and the co-permittees play a key role in assisting in the dissemination of information, including advertising, mailings to existing contact lists, posting on DelDOT's website (e.g., through an events calendar), coordinating with co-permittees to encourage participation at the local level, and providing in-kind or direct funding (based on the needs of the organizing group). Additional ways to disseminate information about events is to revive methods previously utilized by DelDOT, such as:

1. Insert in New Castle County residents' tax bills—this method can be effective, because, as a high-priority mailing, it reaches a broad cross-section of households and is likely to be read.
2. Disseminate information throughout Delaware at various venues, such as:
 - Delaware Rural Water Association
 - Delaware State Fair
3. Disseminate information through various media outlets:
 - a. Public service announcements and ads in several local newspapers, including *Delaware State News*, *Cape Gazette*, and the *Dover Post*.
 - b. TV commercials through Clear Channel Broadcasting and radio spots on WGMD-FM.

The White Clay Creek Management Plan Coordinator has also pledged assistance to DelDOT and the co-permittees in the following areas:

- Development of outreach and educational programs and coordination/selection of stakeholders for educational activities and outreach.
- Scheduling and conducting educational and outreach events, workshops, and seminars for stakeholders.
- Developing a path forward pertaining to the evaluation of the programs and outreach to gauge impressions.

Recognizing this commitment of support and therefore utilizing this group to disseminate information about public events is important. Additionally, sponsorship (in-kind and direct funding) of White Clay Creek outreach programs will provide additional outreach opportunities for the public with little effort and at a lower cost.

Stream Clean-Ups

The Christina River Clean-Up is a county-wide clean-up that began in 1992. The clean-up includes the Christina River, White Clay Creek, Red Clay Creek, and Brandywine Creek watersheds and other tributaries. More than 12,000 volunteers have participated in this event over the years. This clean-up is well established, and DelDOT is an event sponsor. Continued support of this clean-up and other local clean-ups is highly recommended.

Targeted Scale of Impressions (high, medium, low)

High

Cost (high, medium, low)

Low

TARGET AREA 7**BMP Maintenance****Goal**

Ensure the proper functioning (flow control and pollutant reduction) of stormwater-control BMPs through maintenance and monitoring.

Target Audience

HOAs, land holding companies, industries, office parks

Recommended Approach

Maintaining stormwater control BMPs is essential because a poorly maintained BMP negatively impacts the performance and decreases the pollution-reduction capacity of the BMP. Sediment accumulation, litter, and debris are often major factors in reducing the effectiveness of stormwater BMPs.

DeIDOT's NPDES permit requires annual BMP inspection. DeIDOT owns, inspects, and maintains all of its own BMPs. In 2007 DeIDOT developed a statewide stormwater BMP-inspection/maintenance program that provides a consistent protocol for inventorying, inspecting, and maintaining its BMPs.

In New Castle County, the County is responsible for making sure that privately owned BMPs in the county are inspected and maintained. New Castle County will perform major maintenance (sediment removal and structural repair) for BMP's located in residential private open space when their maintenance corporation signs up for the County's Amnesty Program and agrees to perform minor maintenance. Additionally, New Castle County maintains BMPs located in public open space.

New Castle County holds workshops on BMP maintenance. The County also holds two maintenance seminars in the fall for commercial and residential BMP owners. There are several approaches to improve stormwater-BMP maintenance and to educate those who are responsible for BMP maintenance. The approaches recommended in this section apply primarily to the county and municipalities:

- Identify BMPs that have not been maintained due to communal or uncertain ownership/responsibility. Develop a database of these BMPs so they may be inventoried and tracked.
- Inventory the co-permittees' existing programs that monitor, inspect, and/or maintain BMPs within their jurisdictions. Review existing stormwater-BMP operation and maintenance ordinances. For jurisdictions without an ordinance, develop a stormwater-BMP operation and maintenance ordinance, based on existing prototypes. For those with an ordinance there may be a need to improve the ordinance. Education of the responsible parties (community or private group) that they are required to perform maintenance and adhere to the ordinance is also an important component.
- Develop an "Adopt-a-Pond" program that will establish a network of volunteers that will "adopt" stormwater BMPs and help perform annual inspections and maintenance. See the Center for Watershed Protection guidebook for detailed information, www.cwp.org/documents/cat_view/78-other-center-publications.html.

- Assess existing educational materials on stormwater-BMP maintenance and develop new ones as necessary. Education materials should be posted on DeIDOT's and the co-permittees' websites and distributed to the target audience (communities or businesses with BMPs).
- Actively publicize any existing workshops and educational efforts on BMP maintenance.
 - For existing workshops conducted, assess effectiveness through pre- and post-workshop participant surveys.
- Assess sufficiency of workshops by canvassing responsible jurisdictions or organizations.
 - If needed (or if there is a demand), develop educational workshops in coordination with partner organizations with topics that include technical and legal aspects, funding options, maintenance options (e.g., self-support, county, private contractor, etc.).

Targeted Scale of Impressions (high, medium, low)

Low

Cost (high, medium, low)

High

TARGET AREA 8

Residential Low-Impact Development (LID)/Green Technology BMPs that reduce runoff and mimic natural hydrology

Goal

To encourage homeowners to install LID and Green Technology BMPs to reduce stormwater runoff from their property by mimicking natural hydrology.

Target Audience

Homeowners

Recommended Approach

Low-impact development (LID) techniques and the use of “green technology” BMPs constitute part of the emerging trend of ecologically and socially friendly design (such as complete streets and other smart-growth approaches). These designs can be quite effective at reducing the negative impacts of stormwater runoff by reducing volume (through diversion, storage, infiltration, or evapotranspiration) and pollutant loads (through filtering, settling, bio-uptake, or mechanical removal).

Drawbacks or impediments to implementation include the cost involved in installing many of these measures (e.g., bioswales, bioretention basins, tree trenches, filters, green roofs, constructed wetlands, etc.) as well as the fact that to be most effective they must be large-scale or aggregated (e.g., there need to be many properties in an area to make an appreciable difference in flows or loadings). Most installations, therefore, are undertaken by large institutional or commercial enterprises or are included in initial designs of residential developments. Lower-cost approaches can be effectively implemented by individual homeowners, including small rain gardens, water cisterns or rain barrels, etc. Larger private groups such as homeowner associations (HOAs) are often able to implement more extensive, but still lower-cost, BMPs such as grass filter strips or roadside swales.

Emphasis on the education and outreach relating to LID and “green” BMPs can best be implemented by highlighting the benefits of the technologies and techniques to the public and encouraging institutions and businesses, as well as co-permittees, to adopt them where feasible. Existing outlets such as the website can be augmented with information on funding opportunities and cost sharing programs from federal, state, local sources and nonprofit foundations. In addition to consultant lists, engineering and design information can provide material information for groups seeking to initiate these projects. It is important to highlight ambitious, large-scale examples, such as the City of Philadelphia Water Department’s Green City, Clean Waters program, and regional examples of successful implementations by businesses.

To promote awareness in the public at large, it is important to emphasize the aesthetic appeal and environmental benefits, both of larger, highly engineered projects, as well as attractive, easy-to-implement residential-scale projects which are within the ability of homeowners to implement. An area of the website should be dedicated to such “green technologies,” highlighting BMPs, as is currently done, but also making the linkage to the green movement more explicit. If possible, compile examples

of case studies in which attractive and ecologically friendly design has led to increased property values or other benefits (including tax benefits) to homeowners and businesses. Develop a brochure for distribution at events such as Earth Day, Creek Fest, Delaware State Fair, Coast Day, Ag Day and other venues promoting these technologies. Inventory and highlight site-specific problems (such as persistent erosion or flow-volume issues) that these approaches have solved.

Targeted Scale of Impressions (high, medium, low)

Medium

Cost (high, medium, low)

High

5.2 Conclusions and Discussion

This report summarizes information from existing education and outreach campaigns throughout Delaware and the nation. Additionally, critical concepts and tools learned from the workshop held on September 28, 2011, are summarized and analyzed. Using this information, approaches have been developed for each of the eight NPDES Target Areas.

Using lessons learned from the marketing workshop, each component of the Target Area list was addressed specifically. Table 5.1 outlines these lessons, their associated strategies, and specific Target Areas where they apply.

Table 3. *Effective Strategies for Developing NPDES Education and Outreach Programs*

Lesson Learned	Strategy	Target Area
Prioritize	Understand the nature of a given pollution problem to allow assessment of the costs and benefits (i.e., reduction of contamination) involved.	This strategy applies generally to all thematic areas.
Leverage	Use existing programs developed by others; enhance or promote these to quickly and cost-effectively implement educational campaigns.	Lawn Care, Motor Oil, and Hazardous Waste Disposal
Participate	Get involved with initiatives such as stream cleanups, either by organizing or providing funding and personnel.	Stream Clean-up
Target	Focus outreach efforts at the smallest possible interest group to maximize message retention.	Lawn Irrigation/Car Washing, Pet and Yard Waste
Recruit	Involve citizens in the protection of stormwater quality to promote buy-in and give people in affected areas a sense of ownership of the problem.	Illicit Discharges (Public Reporting)
Provide Expertise	In some cases, DelDOT may have knowledge and expertise in specific technical areas of stormwater control and treatment. By providing direct outreach and technical support in these cases, affected populations are most effectively reached.	BMP Maintenance, Low-Impact Development

Table 5.2 summarizes the recommended approaches from Section 5.1 to provide a sense of the Target Areas that provide the highest number of impressions for the least cost (biggest “bang for the buck”). For example, the approach recommended in Target Area 6 (Public Participation/Stream Clean-Ups) gives the highest number of impressions at the lowest cost, whereas Target Area 7 (BMP Maintenance) gives relatively few impressions and generally requires a higher-cost approach to achieve these impressions. This does not imply that one Target Area is of lesser importance; it simply indicates that the number of impressions and cost are important components to consider when developing a campaign and trying to meet the NPDES requirements in the most cost-effective way.

Table 4. *Target-Area Impression and Cost Comparison*

Target Area	Impression	Cost
1 - Illicit Discharges (Public Reporting)	High	Medium
2 - Motor Oil/Hazardous Waste	Medium	Low
3 - Yard/Pet Waste	Medium	Low
4 - Lawn Irrigation/Car Washing	Medium	Medium
5 - Lawn Care	Medium	Low
6 - Public Participation/Stream Clean-Ups	High	Low
7 - BMP Maintenance	Low	High
8 - LID/Green Technology	Medium	High

The NPDES permitting requirements specify that a Public Education and Outreach Plan be developed that will incorporate the information collected in this project. This written plan will include measurable goals and constitute a component of the full Stormwater Pollution Prevention and Management Plan for DelDOT’s NPDES permit. The recommended approaches outlined in this report and the impression-versus-cost analysis will serve as starting points for the Public Education and Outreach Plan. In order to develop this refined plan, the approaches in this report will need further detail. For example, defined action items, specific organizations to work with, stakeholder groups to target, costs, campaign materials, and program areas to develop are critical components to a refined approach. The information in this report can be used to direct this further effort.

Appendix A – Nationwide Programs Referenced

Organization	Contact	Website
<i>Programs Through State Departments of Transportation</i>		
Maryland State Highway Administration	Karen Kauffman, Highway Hydraulics Division (410)545-8407	
	Joan Armacost, Baltimore County (410)887-4488	
	Gale Engels, Carroll County (410)386-2756	
California Department of Transportation (Caltrans)		www.donttrashcalifornia.info
Connecticut Department of Transportation (ConnDOT)		www.ct.gov/dot/cwp/view.asp?a=1383&q=386458
Texas Department of Transportation		www.dontmesswithtexas.org
<i>Municipal, County, and Regional Programs</i>		
Washington, D.C.	Evelyn MacKnight, U.S. EPA Region 3, Water Protection Division, Office of Watersheds, (215)814-5717	
City of Los Angeles	(800)974-9794	www.lastormwater.org/siteorg/education/genpub.htm
City of Chesapeake, Va.	Tammy Barry; (757)382-6983	www.chesapeake.va.us/services/depart/pub-wrks/stormwatermanagement-publiceducation.shtml
Seattle, Wash., Public Utilities	Gretchen Muller (206)684-0570	
Baltimore County, Md.	Lamar Lewis, Stormwater Engineering (410)887-4488	
	Gene Armacost (410)887-4488	
Gwinnett County, Ga.	John Butler (678)376-6914, john.butler@gwinnettcountry.com	
Metropolitan North Georgia Water Planning District/Clean Water Campaign	Charlene (404)463-3259	www.northgeorgiawater.com/html/159.htm
	John Butler, Gwinnett County (678)376-6914	

Appendix B – Representative Questions

1. Reason for implementing the stormwater-education/outreach program:
 - a. To meet NPDES permitting requirements?
 - b. Other reasons?
2. Relative difficulty of implementation:
 - a. What were the easiest programs or program components to implement?
 - b. What were the most difficult programs or program components to implement?
3. What were some specific challenges encountered?
4. Were there aspects that proved problematic that you did not anticipate?
5. Program effectiveness:
 - a. Is this program deemed effective?
 - i. If yes, to what degree, and why?
 - ii. If no, why not?
 - b. How is program effectiveness monitored and measured?
6. Program cost considerations:
 - a. What is the approximate cost of the program, if known?
 - b. If known, what are the relative costs of particular elements (e.g., proportions of materials, printing, time)?
7. Is the program required to meet a certain number of impressions?
 - a. If yes, how was the number of impressions measured?
8. Did you receive public feedback about the program?
 - a. If yes, was there any feedback related to how the program could be improved?
 - b. Were any such suggestions considered?
9. Additional program details:
 - a. Are there any additions/changes to the program that are not shown on the website?
 - b. Are there any additional programs that are not listed on the website that you use to educate the public about stormwater?
10. Is there any additional information that may be useful to DelDOT in implementing similar stormwater-education programs?

Appendix C – NPDES Stormwater-Education and Public-Outreach Workshop Attendees

City of Wilmington
Mary Neutz
Delaware City
Richard Cathcart
DeIDOT
Randy Cole
Marianne Walch
LaTonya Gilliam
Town of Elsmere
John S. Giles, Jr.
Diana Poole
Tina Law
Town of Middletown
Tim DeSchepper
New Castle County
Ellie Mortazavi
Janice Catherman
Bernadette Casella
Carolyn Magnotti
Michael Harris
University of Delaware's Water Resources Agency
Martha Corrozi Narvaez
Andrew Homsey
White Clay Wild and Scenic
Jennifer Egan
Linda Stapleford

Appendix D – Watershed Organizations in Delaware and Working in Delaware Water Resources

Watershed Organization	Town
Appoquinimink River Association	Middletown
Brandywine Valley Association	West Chester (Pa.)
Brandywine Conservancy	Chadds Ford (Pa.)
Christina Conservancy, Inc.	Wilmington
Chesapeake Bay Foundation	Annapolis (Md.)
Coalition for Natural Stream Valleys	Newark
Delaware Audubon Society	Wilmington
Delaware Bass Federation	-
Delaware Center for Horticulture	Wilmington
Delaware Center for the Inland Bays	Rehoboth Beach
Delaware Chapter of the Sierra Club	Wilmington
Delaware Greenways	Wilmington
Delaware Low-Impact Tourism Experiences (DLITE)	Salisbury (Md.)
Delaware Native Plant Society	Dover
Delaware Nature Society	Hockessin
Delmarva Ornithological Society	-
Delaware Riverkeeper Network	Bristol (Pa.)
Delaware Rural Water Association	Milford
Delaware Wild Lands	Odessa
Ducks Unlimited	-
Fairfield Watershed Association	Newark
Friends of Bombay Hook	Smyrna
Friends of the Delaware Bay	Sussex County
Friends of Lums Pond	Bear
Friends of Prime Hook National Wildlife Refuge	Milton

Watershed Organization	Town
Friends of the Nanticoke River	Nanticoke (Md.)
Friends of White Clay Creek State Park	Newark
Green Delaware	Wilmington
League of Women Voters of Delaware	Wilmington
Naamans Creek Watershed Association	Arden
Nanticoke River Watershed Preservation Group	-
Nanticoke Watershed Alliance	Vienna (Md.)
National Wildlife Federation	Annapolis (Md.)
Partnership for the Delaware Estuary	Wilmington
Red Clay Valley Association	West Chester (Pa.)
Save Wetlands and Bays	Millsboro
St. Jones River Greenway Commission	Magnolia
St. Jones River Watershed Association	Dover
Surfrider Foundation Delaware Chapter	Millsboro
The Academy of Natural Sciences	Philadelphia (Pa.)
The Conservation Fund	Centreville
The Nature Conservancy - Delaware Chapter	Wilmington
Urban Environmental Center	Wilmington
Waterfront Watch of Wilmington	Wilmington
White Clay Creek Watershed Association	Newark
White Clay Creek Watershed Management Committee	Newark
White Clay Flyfishers	Landenburg (Pa.)
Widener Environmental and Natural Resources Law Clinic	Wilmington



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