4 CASE STUDY NATURAL ASSETS

The Partnership for a Livable Roanoke Valley identified a strategy to improve water quality by reducing stormwater runoff. The strategy calls for developing a regional stormwater banking program that allows property owners to reduce on-site water treatment improvements in exchange for payment into a stormwater banking program.

Two programs were reviewed as case studies for the Partnership to learn from when establishing its own stormwater management program: the Upstate Stormwater Banking Program in Greenville County, South Carolina and the Stormwater Management Tax in the District of Columbia. The Upstate program's goal is to improve stormwater quality through a volunteer incentive program focusing on single family residential zones and commercial parking lots. The DC program's goal is to reduce stormwater quantity through a mandatory requirement for all developments in the District to retain stormwater.

By examining two programs related to stormwater management, this case study provides the Partnership with a wide view of the potential ways to address stormwater through voluntary and mandatory programs that address stormwater quantity and quality. While both programs have not yet been fully implemented, the development and approach of the programs provides the Partnership lessons for developing its own program.

CASE STUDY: UPSTATE FOREVER STORMWATER BANKING PROGRAM

The Upstate Stormwater Banking Program was developed by Upstate Forever, a non-profit, membership-based regional organization committed to "promoting sensible growth and protecting special places in the Upstate region of South Carolina."[1] With over 2,000 public, private, and institutional members, Upstate Forever furthers its mission by focusing on three programs – Land Trust, Clean Air and Water, and Sustainable Communities – in 10 counties in South Carolina's Upstate region. The Upstate Stormwater Banking Program is part of Upstate Forever's Clean Air and Water program and was developed with a $1.1 million EPA grant awarded in 2008.[2] The intent of the grant was to develop market-based programs to improve water quality in the Upstate region.

In 1999 a large lake downstream of Reedy River experienced a significant algal bloom, which generated strong community interest in the watershed. The river is impaired but the development of Total Maximum Daily Loads (TMDL) had been a complicated and delayed process. Therefore, Upstate Forever launched the Stormwater Banking Program to develop a non-regulatory, market-based solution to improve water quality in the watershed. Since Upstate Forever's focus area spans 10 counties, for the Stormwater Banking Program they decided to focus on two areas to test the program. They developed

1 Upstate Forever Website. Who We Are & What We Do, http://upstateforever.org/about.html, (October 25, 2013).

2 The grant was awarded through the Targeted Watershed Implementation Grant Program, which is no longer active.

a pilot program focusing on single family residential zones in Greenville County and another pilot program focusing on commercial properties in the City of Greenville.

COMMUNITY PROFILE

Greenville County and the City of Greenville are located in the heart of the Greenville-Spartanburg Corridor, the second largest urban area in South Carolina. Over the past 20 years, the Greenville-Spartanburg Corridor has developed a robust economic development program to attract manufacturing facilities. Since 1992, the region has successfully attracted BMW, Michelin, General Electric, Lockheed Martin, and the Chinese packaging designer Yungcheung to establish manufacturing facilities in the region. These efforts have made the Corridor one of the largest industrial hubs in the south and prompted the Brookings Institution to include the Greenville-Spartanburg Corridor on its list of the most "globally fluent" regions in the world.[3]

The 10-county Upstate region is home to roughly 1.35 million people. The most populous and fastest growing county in the region is Greenville County with a population of 467,605 in 2012[4] and a growth rate of 18.9% from 2000 to 2009.[5] The City of Greenville is the population center of the County with 60,709 inhabitants in 2012.[6] With economic development efforts continuing to attract employers to the region, the County and the City of Greenville are projected to continue to grow at a ten-year rate from 2010 to 2020 of 9.2%[7] and 11.5%[8] respectively.

A Clemson University study found that the Upstate region is consuming land at five times the rate of population growth.[9] This trend indicates the predominant growth pattern is low-density sprawling development. The study found that this development pattern can have a long term negative impact on water quality by destroying natural vegetation and non-compacted soils necessary for good water quality.[10]

3 McDearman, Brad, Greg Clark, Joseph Parilla, The 10 Traits of Globally Fluent Areas: Greenville Profile, The Brookings Institution, June 26, 2013.
4 U.S. Census Bureau
5 Upstate Forever Website. Our Region, http://upstateforever.org/region.html, (October 25, 2013).
6 U.S. Census Bureau
7 Ibid.
8 City of Greenville Population Projections, http://www.greenvillesc.gov/PlanningZoning/forms/CompPlan/AppendixII-AandII-B.pdf, (October 25, 2013).
9 Campbell, C., J. Allen, And K.S. Lu, Modeling Growth and Prediction Future Developed Land in the Upstate of South Carolina, Strom Thurmond Institute, Clemson University, 2007
10 Ibid.

PROGRAM DESCRIPTION

Residential Stormwater Banking Program

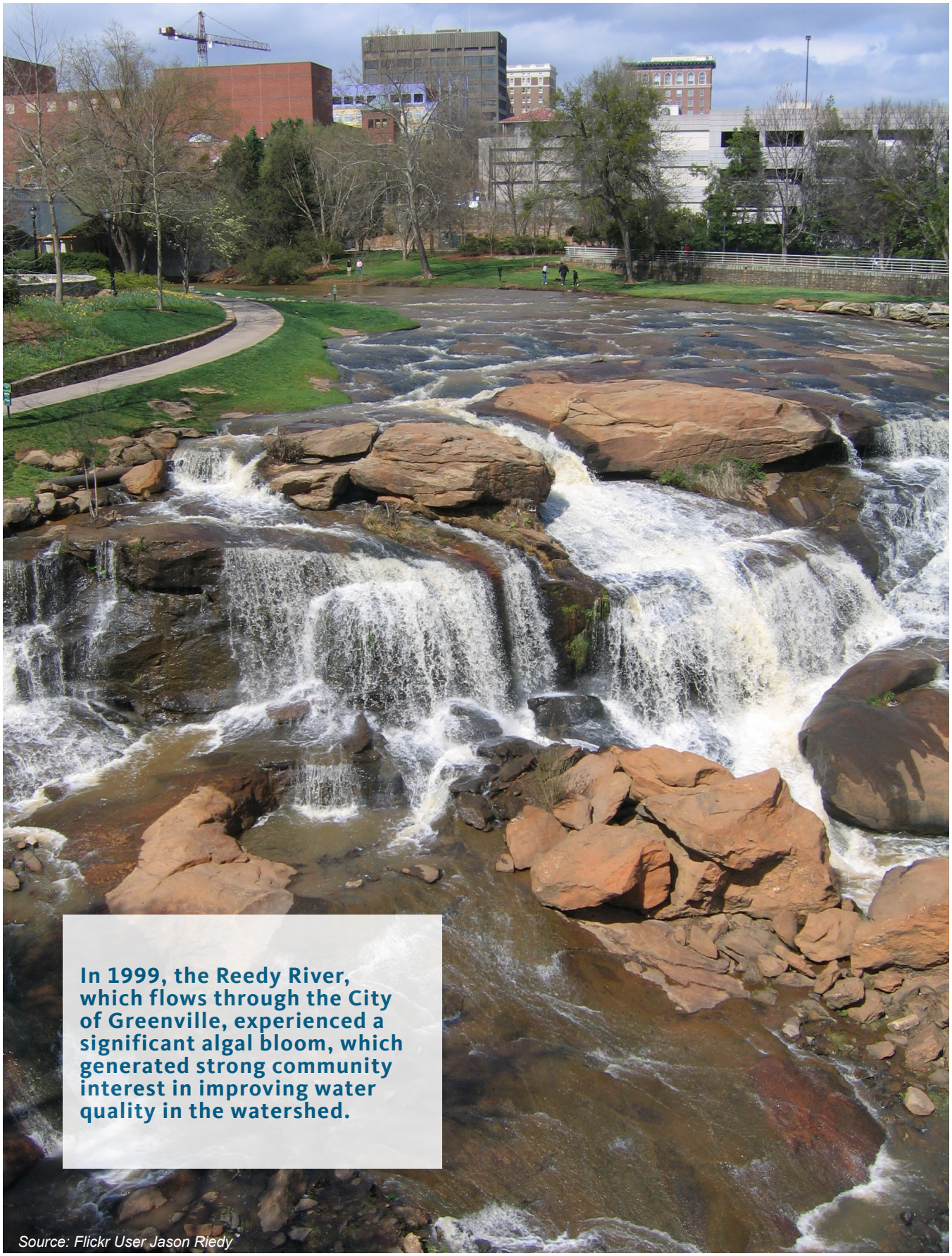
The intent of the Residential Stormwater Banking Program is to improve stormwater quality through an incentive-based program that encourages compact development and allows a single-family residential density bonus. Other benefits of the program are reduced infrastructure costs associated with compact vs. sprawling development patterns.

The current zoning ordinance in the Greenville County has promoted single family housing and a suburban density and pattern of development known as 'sprawl.' The future land use plan in the County Comprehensive Plan calls for implementing a Communities, Centers, and Corridors strategy "to encourage growth in areas that can best support new development" and discourage low-density, dispersed development (see Figure 1).[11] Since the zoning and the future land use plan do not currently align, the team developing the Residential Stormwater Banking Program recognized an opportunity to initiate better stormwater management practices.

Upstate Forever partnered with Clemson University to develop a model of Greenville County to compare the impact of compact and sprawling growth patterns on stormwater quantity and quality. The study found that "water quality and quantity impacts are consistently higher for the sprawling as compared to the compact scenario. As more land is developed in the sprawling scenario, the amount of stormwater increases while water quality decreases."[12] This study and the discrepancy between the county's zoning and future land use maps, allowed Upstate Forever to develop the Stormwater Banking Program granting developers single-family residential density bonuses if the following requirements are met:

- the proposed development is within the Program Area (defined below);
- the proposed development plan scores at least 70 points using the Decision Making Tool (described below);
- the developer pays a participation fee;
- the development plan includes two access roads; and
- the density bonus is approved by County Council.[13]

11 Greenville County, Greenville County Comprehensive Plan: Imagine Greenville County, Tomorrow's Vision Today, 2009, p. 48
12 Privette,C.V., S.W. Taylor, J.C. Hayes, L.S. Hallo, and H.B. Nix, Forecasting the Impacts of Future Development within the Reedy River Watershed on Water Quantity and Quality, Clemson University and Upstate Forever, 2011.
13 Upstate Forever wanted the density bonus to be automatic and not go before County Council for approval. If in two years no one has applied for a



In 1999, the Reedy River, which flows through the City of Greenville, experienced a significant algal bloom, which generated strong community interest in improving water quality in the watershed.

Source: Flickr User Jason Riedy

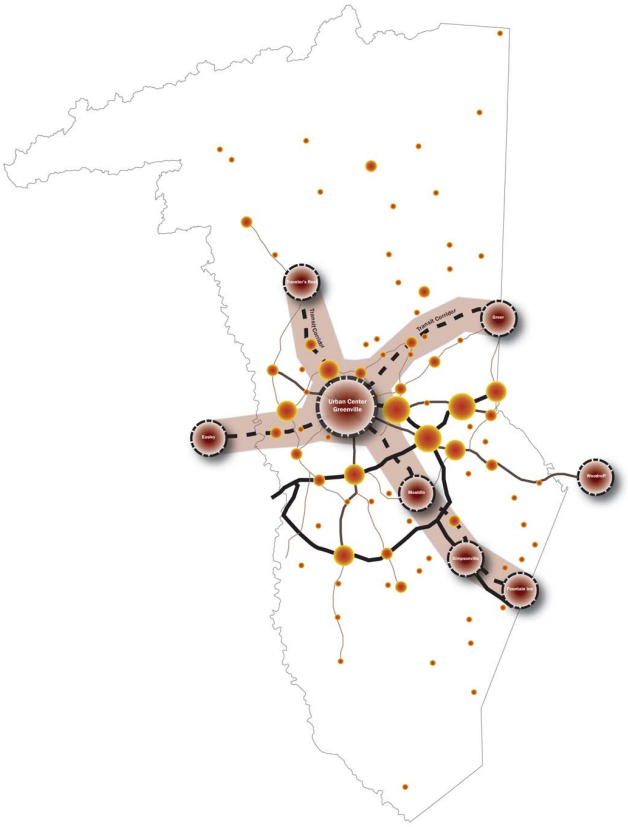


FIGURE 1 This diagram depicts the Communities, Centers, and Corridors identified in the Greenville County Comprehensive Plan (Source: Greenville County Comprehensive Plan)

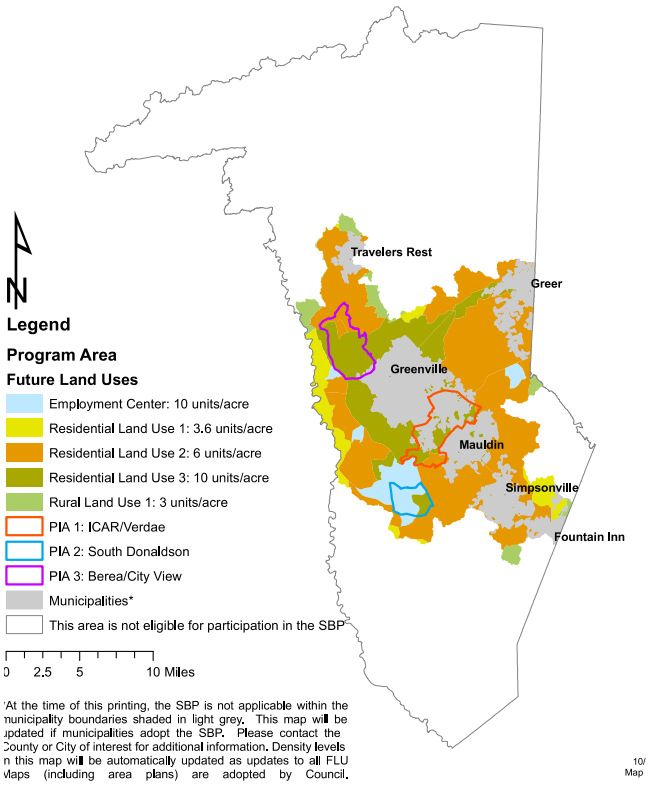


FIGURE 2 The Program Area with future land use maximum densities. (Source: Upstate Forever)

The Program Area, the central portion of Greenville County, was established through a methodical ranking process. Each sub-watershed in the county was rated on 14 factors which include existing development, existing infrastructure, and transit availability. The areas with the most points were included in the Program Area. This methodical and transparent process gave Upstate Forever a justification for the areas that were included in the final Program Area. The permitted maximum densities within the Program Area were established by the Greenville County Comprehensive Plan (see Figure 2).

The Decision Making Tool (DMT) is an excel-based tool, developed by Upstate Forever in partnership with Clemson University, that developers use to rate their proposed developments on three scales: regional scale, neighborhood scale and site scale. The final DMT score must be 70 or higher out of 455 possible points, with at least 40 points coming from the site scale section. Upstate Forever and the county intentionally set a low minimum score to qualify for the program because they want to encourage developments to participate in the program and develop higher-density residential developments, which are better for water quality.

- **Regional Scale** Upstate Forever sought to establish a program that incorporated the regional function and scale of stormwater impacts. This section assesses the proposed development's regional impact on water quality by awarding points for the following sample items: at least 75% of the project perimeters border previously-developed parcels, no wetlands are located on the project site, project site maintains a permanent 100' vegetated buffer from water resources, proximity to mixed uses, and others.

- **Neighborhood Scale** The neighborhood scale section assesses a site's connectivity and street network by awarding points for the number of intersections outside the project site, the number of links and nodes within the development, the street widths, public transit access, bicycle access, and others.

- **Site Sale** The site scale section awards points for items such as the runoff factor, percent of the site that has been previous developed, percent impervious, stormwater detention factor, nutrient capture factors,

density bonus under the Residential Stormwater Banking Program, Upstate Forever may lobby County Council to remove the up-down vote requirement.

and others. Proposed developments can achieve the required 40 points in this section by meeting the county's stormwater treatment requirements, which may include installing low-impact development (LID) measures on-site.

The Residential Stormwater Banking Program will be administered by the Greenville County Land Development Division and Planning Department, which are responsible for verifying components of the scores submitted by developers. The DMT facilitates the development review process and calculates the participation fee the developer must pay in order to receive the density bonus. If a developer's proposal scores above the 70 points required by the program, the participation fee decreases. The fees collected by the county will be used to install LID measures throughout the county.

Commercial Stormwater Banking Program

The City of Greenville was the project area for the pilot Commercial Stormwater Banking Program. The goal of the commercial program is to reduce parking lot sizes and encourage the incorporation of LID measures. Upstate Forever developed the commercial program by first conducting a parking study with Furman University and the City of Greenville. The purpose of the study was to verify the need for the parking requirements mandated in the off-street parking and loading standards in the zoning ordinance. The study evaluated off-street parking use during peak times for various commercial land uses. For example, Upstate Forever conducted a flyover of retail use parking areas on the day after Thanksgiving (the peak day of the year) to assess peak demand. The study concluded that there was an excess parking requirement of 26 to 65 percent varying by land use.[14] Based on this finding Update Forever recommended changing the City of Greenville's parking standards to reduce parking requirements, which the city enacted.

After evaluating the existing parking conditions and changing the city's parking standards, Upstate Forever worked with the city to develop the Commercial Stormwater Banking Program which offers three options to developers:

1. Development meets the parking requirement specified in the revised city parking standards.

2. Development may exceed the parking requirement only if appropriate LID measures are installed to manage the stormwater runoff from the extra parking spaces.

3. Development may exceed the parking requirement with payment of an in-lieu fee of $750 per extra space.[15] The fee is used to install stormwater retrofits throughout the city.

IMPLEMENTATION

Residential Stormwater Banking Program

The Residential Stormwater Banking Program was officially adopted in April 2013 by Greenville County. To date, no proposals have been submitted for density bonuses under the program. The program was developed by Upstate Forever with support from Greenville County and is being administered by Greenville County's Land Development Division and Planning Department. The program was designed to be implemented by current county staff and does not require additional staff positions. Since it may take longer for the staff to approve a participating development, since there are several factors to review in the DMT, 25 percent of the fee collected will cover administration costs.

Commercial Stormwater Banking Program

The commercial program was adopted in June 2013 and is being administered by the City of Greenville existing staff. There have been a few instances of developers meeting the revised parking requirement and not building additional parking. Additionally, one developer elected to pay the in-lieu fee and a few developers have chosen to install LID measures in order to build parking spots in excess of the city's requirement.

ASSESSMENT

Residential Stormwater Banking Program

The residential program is an innovative approach to stormwater management. It is too early to know how successful the program will be since to date no land owners have participated in the program. However, there are several lessons

14 Holls, Erika, Phone Interview conducted on October 14, 2013.

15 The fee was developed by taking an average of the cost of implementing LID measures.

that can be learned by analyzing the program development process:

- **Establishing allegiances with the development community is essential in achieving political buy-in.** Partnering with home builders and the real estate community was essential to developing a program that addressed their concerns and would attract them to participate. At the request of developers, Upstate Forever and Greenville County decided to waive minimum lot sizes and minimum setbacks as well as permit single-family attached units for developments approved for the density bonus. Please note minimum side setbacks required by the International Fire Code still apply to participating developments.

- **The discrepancy between zoning and future land use provides opportunities for innovative solutions that might not be otherwise possible.** The program was possible because of the discrepancy between actual zoning and intended future land use. Since the additional density is already included in the comprehensive plan, but not allowed in the zoning ordinance, the density increases introduced by the program are less controversial to the County Council. If a community does not have a gap between the zoning and future land use maps, this program may not be effective.

- **Skeptic's concerns can be calmed with evidence-based data.**
  - Sanitary sewer providers were initially alarmed by the potential consequences of the proposed residential program as they believed their current lines would be under-sized to support increased density. However, Upstate Forever explained that providing water and sewer service to compact development can cost nearly half the cost of providing services to sprawling development. The cost of increasing line size would be far less than the cost of conveying miles of new lines to sprawling developments. The county also increased communication with the sanitary sewer providers by including them in the initial development review process.
  - The fire chiefs were concerned that the DMT section awarding points for narrow streets would result in streets too narrow to allow for emergency vehicle access. Upstate Forever clarified that the proposed street widths meet the International Fire Code and highlighted that the requirement to include two access roads would provide increased emergency access as compared to typical residential developments. Additionally, Upstate Forever provided information showing that well-design compact development is beneficial to public safety, including 1) diagrams of adequate street function, and 2) an academic study that found, "urban sprawl is significantly associated with increased EMS response time and a higher probability of delayed ambulance arrival following motor-vehicle crashes in the U.S. The results of this study suggest that promotion of community design and development that follows smart-growth principles and regulates urban sprawl may improve EMS performance and reliability."[16]

Commercial Stormwater Banking Program

The initial success of the commercial program was the ability to convince the City of Greenville and its commercial land owners that existing parking standards require an excess of parking. It is promising that within five months of launching the commercial program six developers have either incorporated LID measures or paid the in-lieu fee for parking spaces built beyond the parking requirement. Nonetheless a full assessment of the program cannot be accomplished with such a small data set. However, there are a couple lessons to be drawn from the process:

- **Developers have responded favorably to option to reduce parking rates based on evidence of reduce parking demand.** The parking study convinced the city that the city parking standards are too high. It was not difficult to get developers on board with the new parking standards as they do not want to pay to construct parking to meet an unnecessary city parking standard.

- **Allowing developers options to exceed the parking standard while meeting the goals of the program encourages businesses to remain in the city.** The city was concerned that placing a cap on parking

16 Trowbridge, Matthew, Matthew Gurka, and Robert O'Connor, "Urban Sprawl and Delayed Ambulance Arrival in the U.S.," Journal of Preventative Medicine, 37(5), p.428

spaces would encourage businesses to locate outside the city. The commercial program offers two options for developers to exceed the parking standard, which gives developers the flexibility to build more parking if needed.

CASE STUDY: DISTRICT OF COLUMBIA STORMWATER MANAGEMENT REGULATION

Released in July 2013 by the District Department of Environment (DDOE), the new Stormwater Management Regulation is a significant change from the 1988 Stormwater Management Regulation it replaces. The new regulation creates a first-of-a-kind stormwater retention market that allows landowners in highly dense urban areas with limited land area available for SWM to comply with the more demanding regulation by purchasing Stormwater Retention Credits (SRC) on an open market. This innovative shift in stormwater management approach is the result of a concerted regional effort to clean the Chesapeake Bay Watershed by several organizations including the Office of the President of the United States, the U.S. Environmental Agency (EPA), the District of Columbia, and many more non-private, public and private entities.

In 2011, the EPA issued DC a new MS4[17] permit which added a requirement to regulate stormwater quantity by implementing a stormwater retention standard for the 1.2" storm. The previous MS4 permit regulated water quality and quantity for the 0.8" storm but did not stipulate a stormwater retention standard. The new requirement prompted DC to overhaul its 1988 Stormwater Regulation which did not require on-site retention and used a volume release delay method for stormwater management, which recent research has shown leads to increased stream erosion. The new retention requirement is the driver of the SRC purchasing program.

A related driver of the new Stormwater Management Regulation is the combined-sewage overflow (CSO) problem the city is facing. When a significant rainfall event happens in the District, stormwater flows into sewage lines, which exceed capacity causing the excess to flow into the Anacostia and Potomac Rivers. CSO events occur frequently and greatly reduce the water quality of the two rivers. By implementing the new regulation, the District is trying to reduce the quantity of stormwater flowing into the city's sewage lines which will help improve the water quality of the Anacostia and Potomac. Concurrently, DC Water, the city's water and sewer authority, is also expanding line capacity and implementing measures to reduce CSO events.

COMMUNITY PROFILE

The District of Columbia is located at the confluence of the Potomac and Anacostia Rivers. After decades of decline, the city's population is 632,323.[18] The population increased at a 5 percent ten-year rate from 2000 to 2010[19] and is projected to increase at an average 9 percent ten-year rate by 2040.[20] The central portions of DC are ultra-urban, a term which refers to areas that are highly developed and generally characterized by large areas of impervious cover. This high degree of impervious surface generates significant volumes of stormwater runoff. The outer portions of the District, closer to the border with Maryland, are still very developed although less impervious and less dense than the central business district.

The District has several ongoing initiatives to promote sustainability and improve water quality. The Sustainable DC Plan outlines goals and strategies under 13 categories to meet defined sustainability targets by 2032. One target is "by 2032, make 100% of District waterways fishable and swimmable."[21] The DDOE charges a monthly stormwater fee for impervious surface cover of $2.67 for 1 ERU. [22]The municipal water authority, DC Water, also charges a monthly stormwater fee for impervious cover of $11.85 for 1 ERU. Both stormwater fees are increased annually for inflation. Both programs offer discounts if landowners implement best management practices (BMPs) on-site that retain stormwater from the 1.2" storm. DDOE grants a 55 percent discount and DC Water grants a 4 percent discount.

17 *MS4 = municipal separate storm sewer systems*

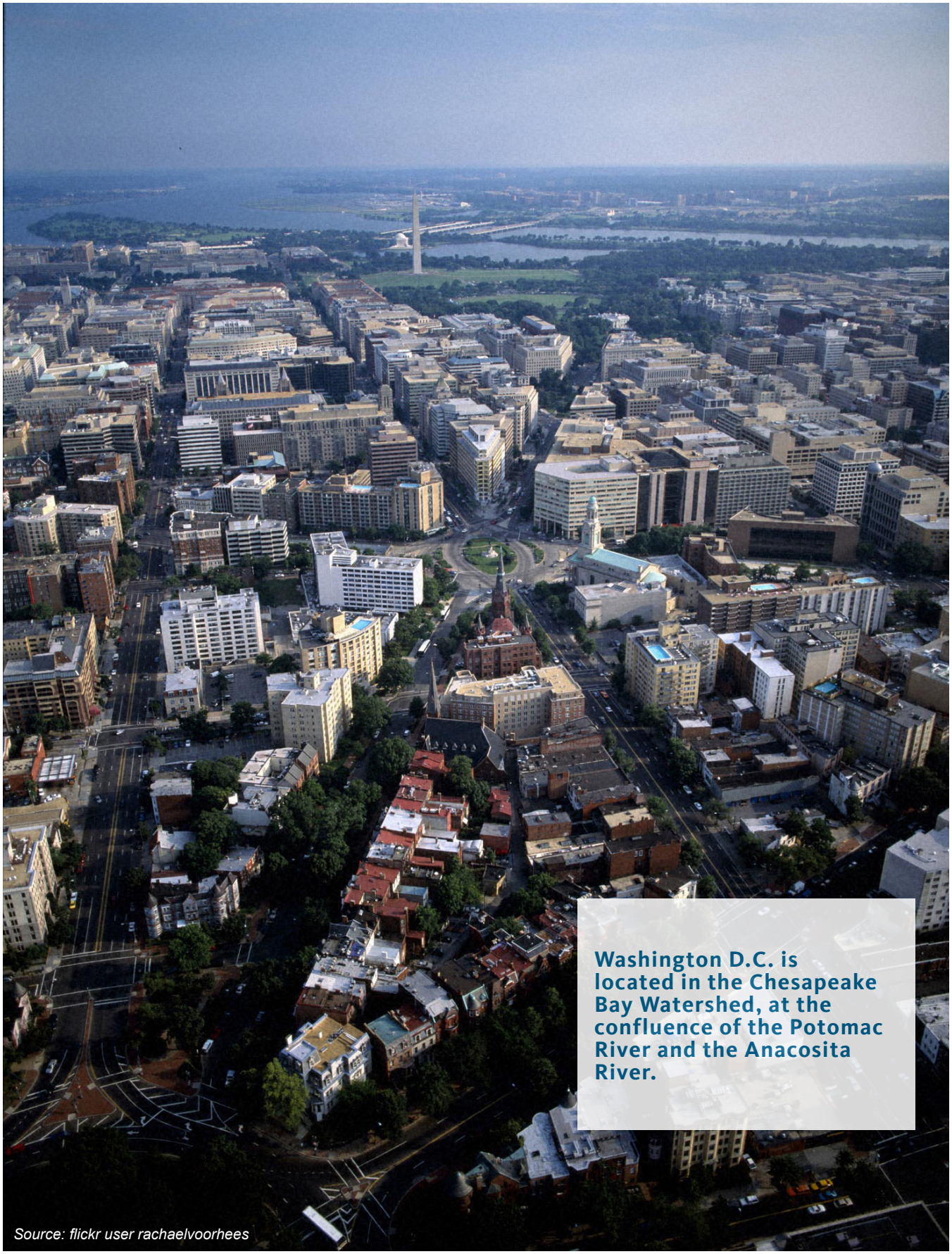
18 *U.S. Census Bureau*

19 *Metropolitan Washington Council of Governments, Our Changing Region: Highlights from the 2010 Decennial Census, July 23, 2011, http://www.mwcog.org/uploads/pub-documents/pV5eWV020111011135345.pdf (October 30, 2013).*

20 *Metropolitan Washington Council of Governments, Round 8.2 Cooperative Forecasting (Digital Materials): Employment, Population , and Households, July 25, 2013, http://www.mwcog.org/store/item.asp?PUBLICATION_ID=466 (October 30, 2013).*

21 *District of Columbia, Sustainable DC Plan, 2013, p. 13.*

22 *ERU = equivalent residential unit, or 1,000 SF of impervious surface cover*



Washington D.C. is located in the Chesapeake Bay Watershed, at the confluence of the Potomac River and the Anacosita River.

Source: flickr user rachaelvoorhees

PROGRAM DESCRIPTION

When the new Stormwater Management Regulation is fully rolled out in July 2015, the regulation will require the following:

- Projects with major land disturbing activity must retain stormwater from the 1.2" storm. Major land disturbing activity is an activity that disturbs 5,000 square feet or greater of land area. A project with multiple distinct areas that each disturbs less than 5,000 square feet of land and that are non-contiguous sites is not defined as major land disturbing activity.

- Projects with major substantial improvement activity must retain stormwater from the 0.8" storm. A major substantial improvement activity is defined as a project for which the combined footprint of improved building and land-disturbing activity is 5,000 square feet.

For both types of projects, at least 50 percent of the stormwater must be retained on-site and the balance can be met with payment of the in-lieu fee, Stormwater Retention Credits (SRC), or a combination of both.

The DDOE published the Stormwater Management Guidebook in July 2013, which provides technical guidance on how to comply with the Stormwater Regulation and describes 13 BMPs that can be implemented to comply with the minimum 50 percent on-site retention rule. If a site cannot achieve 50 percent on-site retention, the landowner must provide supporting documentation to DDOE proving that the 50 percent requirement cannot be met on-site due to technical or environmental reasons. The total amount of stormwater that a project is responsible for (through on-site retention, in-lieu fee payment, and/or SRCs) is calculated using the formula shown in Figure 3.[23]

The in-lieu fee is $3.50 per gallon of stormwater per year and is adjusted annually for inflation. The fee was generated by averaging the cost of BMPs installed in the District by the DDOE. The proceeds from the in-lieu fee will pay back the DDOE for its continuous implementation of BMPs throughout the District.

One Stormwater Retention Credit is equivalent to 1 gallon of water retained on-site per year. The SRCs can be purchased on the SRC market. Landowners can register for SRCs by applying to the DDOE for certification of BMPs that retain water from a minimum of the 0.8' storm and a maximum of the 1.7" storm. The landowner must also submit a stormwater management plan and a BMP maintenance plan with their application for SRCs. Each SRC has a unique number that includes a code for the watershed where the SRC is located. Once the owner has DDOE-certified SRCs, the SRC owner can sell the SRCs to landowners who need SRCs to meet their stormwater retention requirement. The price of the SRCs will be set by the market, but probably be under $3.50 to be competitive with the in-lieu fee. The in-lieu fee was priced high enough to give the market space to be competitive. The District established the SRC market in recognition of the fact that certain BMPs are less expensive to install in less-urbanized areas. The SRC market provides developers other options, beyond installing BMPs on the project site (which may be cost prohibitive beyond the required 50 percent on-site retention) and paying the in-lieu fee, to meet the Stormwater Regulation. If a landowner owns several properties in the District and one property is more suitable for BMPs than the other, she may register SRCs for one property and transfer them to the other. The DDOE will facilitate the SRC market by posting the name, contact information, and SRC sale price of SRC sellers on its site.

The SRC information and the application process are available on a District-run website. The DDOE will grant SRCs for three years and will inspect BMPs to ensure proper maintenance every two years. An SRC owner can retire SRCs if he decides to remove the BMP in order to develop the land. However, if the SRCs have been sold to an SRC buyer, the SRC seller must pay the in-lieu fee to the District for any SRCs that were sold.

All areas of the District have the same stormwater retention requirement, except for areas within the Anacostia River Plan. Properties in the Anacostia area that elect to purchase SRCs can use SRCs from the Anacostia area at a 1-to-1 ration, but SRCs from other sub-watersheds can only be applied on a 1-to-1.25 ratio. The purpose of this rule is to align with the District's goals of improving the water quality in the Anacostia River, the most polluted waterway in the city. By singling out the Anacostia Area and making SRCs from that area more valuable, the District is incentivizing landowners to implement BMPs on private land and sell SRCs on the market in the most critical part of the watershed.

23 Branosky, Evan and Greg Hoffman, Generation and Certification of Stormwater Retention Credits, District Department of Environment Public Training Session on the SRC Program (Washington, D.C.), October 24, 2013.

IMPLEMENTATION

The new Stormwater Management Regulation is being rolled out over an 18-month period, which includes three transition periods (see Figure 4):[24]

- **Transition Period 1** All major projects must comply with the 1988 Stormwater Regulation
- **Transition Period 2A** All major land-disturbing activities must comply with the new Stormwater Regulation; however, the minimum 50 percent on-site retention is waived. The entire retention volume may be achieved off-site.
- **Transition Period 2B** All major substantial improvement activities must comply with the new Stormwater Regulation; however, the minimum 50 percent on-site retention is waived. The entire retention volume may be achieved off-site.

The purpose of waiving the minimum 50 percent on-site retention requirement during Transition Period 2 is to jump-start the SRC market and to also allow landowners more time to adjust to the new regulations. Any projects that have unexpired site approvals from agencies (e.g. DC Historic Preservation Review Board, Commission on Fine Arts, National Capital Planning Commission, DC Board of Zoning Adjustment, or the DC Office of Planning) are exempt from the new rule. Additionally, multi-phase projects for which all stormwater infrastructure and BMPs were installed in compliance with DDOE during earlier construction phases are

24 *District Department of Environment, Summary of Transition Plan for Stormwater Management Performance Requirements, July, 31, 2013.*

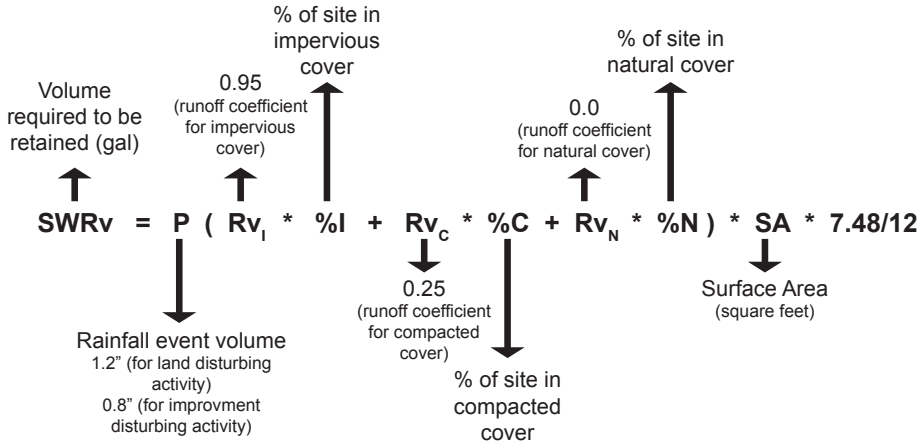


FIGURE 3 Calculation for Determining Required Stormwater Retention Value

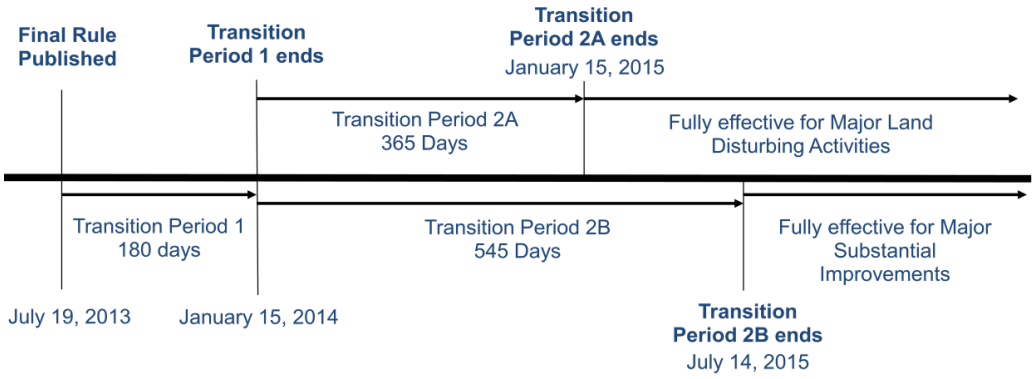


FIGURE 4 Transition Plan for the new Stormwater Regulation Requirements. (Source: DDOE)

deemed to have met the stormwater management requirements. The Stormwater Management Regulation is entirely administered and staffed by the DDOE.

ASSESSMENT

The DDOE's new Stormwater Management Regulations are a brand new approach to managing stormwater. Although there are programs that seek to improve water quality by creating a nutrient trading market place, no program has ever been established in the U.S. that seeks to reduce water quantity by creating a stormwater retention market place. Since this is an innovative approach and the program has not been fully rolled out, it is a bit early to determine the program's success. However, lessons can be learned from the process of developing the new regulation.

- **A similar program would be difficult to develop without the new MS4 permit requirement.** Although there is pressure to address stormwater quantity and quality in an effort to clean the Chesapeake Bay, the primary driver behind the DDOE Stormwater Management Regulation is the new MS4 permit which mandates the District to retain stormwater. Absent of this permitting requirement, it would be very politically-challenging to develop and implement this new regulation.

CONCLUSION

While both the Upstate Forever Stormwater Banking Program and the DDOE Stormwater Management Regulation both seek to improve waterways in the respective regions, the programs are significantly different. The Upstate Forever program seeks to improve stormwater quality through a voluntary, incentive-based density bonus program. The DDOE program was developed in response to an EPA mandate requiring the District to develop a mandatory stormwater retention requirement for all significant construction projects. The development of the Upstate Forever program was led by a regional non-profit organization in partnership with universities and local government. The DDOE program was developed entirely by staff in the DDOE.

The programs are similar in that they both look to the market to drive a robust outcome. The Upstate Forever program is attempting to capitalize on a gap between the zoning code and the comprehensive plan to provide developers with an easier option to develop higher-density developments. If the market does not exist for higher-density development, then developers will not see a need to use the Stormwater Banking Program. However, Upstate Forever's developed the Stormwater Banking Program with close consultation from the development industry, who assured Upstate Forever that there is a market for higher-density residential developments than the current zoning allows.

The DDOE is introducing a new stormwater retention market to allow landowners with properties where BMPs would be easily implemented at low-cost to capitalize on their land and sell credits to landowners with properties in areas where BMPs are more costly to implement. The SRC market allows landowners with property in the ultra-urban, as well as the less-urban environments to participate in trading which can reduce costs for those with ultra-urban properties and generate income for those with less-urban properties. The SRC market additionally encourages the construction of BMPs on land that is not controlled by the District, thereby furthering the District's target of achieving 100 percent swimmable waterways by 2032.

Since the both programs are new, it is difficult to gauge their success. However, by studying the motivation, process, and program details of these programs, the Partnership for a Livable Roanoke Valley can begin to craft its own stormwater management program to further its Natural Assets goal of "working collaboratively to preserve the historic and natural assets of the region."

RESOURCES

Stormwater Banking Program, Upstate Forever, South Carolina

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Program Website
http://www.upstateforever.org/progCAW_stormwater-Banking.html

Referenced Documents

Campbell, C., J. Allen, And K.S. Lu, "Modeling Growth and Prediction Future Developed Land in the Upstate of South Carolina," Strom Thurmond Institute, Clemson University, 2007. http://www.upstateforever.org/newsviews_other/080200_UpstateGrowthStudy.pdf

Greenville County, Greenville County Comprehensive Plan: Imagine Greenville County, Tomorrow's Vision Today, 2009. http://www.greenvillecounty.org/gcpc/pdf/comprehensive_plan.pdf

McDearman, Brad, Greg Clark, Joseph Parilla, The 10 Traits of Globally Fluent Areas: Greenville Profile, The Brookings Institution, June 26, 2013. http://www.brookings.edu/~/media/Multimedia/Interactives/2013/tentraits/Greenville.pdf

Privette,C.V., S.W. Taylor, and J.C. Hayes, Clemson University: L.S. Hallo and H.B. Nix, Upstate Forever, "Forecasting the Impacts of Future Development within the Reedy River Watershed on Water Quantity and Quality, 2011. http://www.upstateforever.org/progCAWdocs/2012.02.10_TWGReportWaterQualityPredictionAssessment.pdf

Trowbridge, Matthew, Matthew Gurka, and Robert O'Connor, "Urban Sprawl and Delayed Ambulance Arrival in the U.S.," Journal of Preventative Medicine, 37(5), 428-432.http://www.cnu.org/sites/www.cnu.org/files/UVA_sprawl&EMS_11.2009.pdf

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Stormwater Management Regulation Website
http://ddoe.dc.gov/swregs

Referenced Documents

Branosky, Evan and Greg Hoffman, Generation and Certification of Stormwater Retention Credits, District Department of Environment Public Training Session on the SRC Program (Washington, D.C.), October 24, 2013. http://ddoe.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/SRC%20Certification%20Training-%202013%20SW%20Rule_0.pdf

District Department of Environment, 2013 Rule on Stormwater Management and Soil Erosion and Sediment Control, July 19, 2013, http://ddoe.dc.gov/node/610592

District Department of Environment, Stormwater Management Guidebook, July 19, 2013, http://ddoe.dc.gov/node/610622

District Department of Environment, Summary of Transition Plan for Stormwater Management Performance

Requirements, July, 31, 2013, http://ddoe.dc.gov/node/610592

District of Columbia, Sustainable DC Plan, 2013. http://sustainable.dc.gov/finalplan