# NEW JERSEY FLOWS

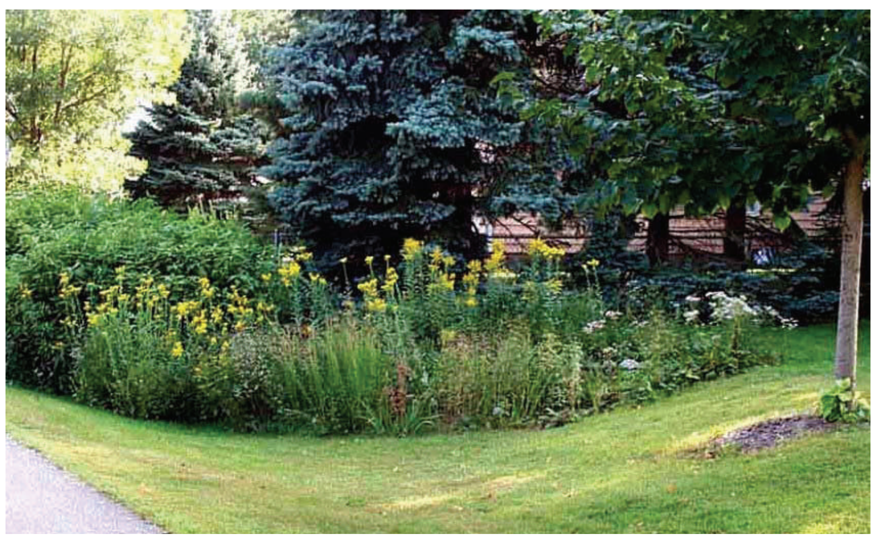
New Jersey Water Resources Research Institute

**Volume IX, Issue II** **Fall 2008**


## The Rain Garden/Bioretention Research and Extension Symposium

The Rain Garden/ Bioretention Research and Extension Symposium was held May 29 and 30, 2008 at the Heldrich in New Brunswick, NJ. This symposium covered a wide range of related topics through presentations from experts in the area of biorention systems/rain gardens and related stormwater management topics. Researchers from across the country shared their latest research findings. Background information about the beginnings of bioretention was presented along with case studies of implementation and education projects. Additionally, panel discussions explored future research needs and how to bridge the information gaps between researchers, educators and activists.

The symposium was attended by 118 people. Attendees included: representatives from the New Jersey Department of Environmental Protection; United States Geological Survey; United States Environmental Protection Agency-Region 2; New York City Department of Environmental Protection; Rutgers, the State University of New Jersey; New Jersey Institute of Technology; North Jersey Resource Conservation and Development Council; AmeriCorps; Environmental Commissions throughout New Jersey. Also in attendance were engineering consultants, members of planning boards, public works departments, watershed organizations, and representatives from school districts throughout New Jersey.



Speakers from the University of Minnesota Extension; University of Maryland; Villanova University; University of New Hampshire Stormwater Center; Kansas State University; University of Wisconsin; Rutgers, the State University of New Jersey; North Carolina State University; Griffith University, Australia; City of Columbia, Missouri; University of New Hampshire; Washington Conservation District; and Cornell University presented at the symposium.

This symposium was presented by the Rutgers Cooperative Extension Water Resources Program, New Jersey Sea Grant Extension Program, New Jersey Water Resources Research Institute, and the USDA CSREES Regional Water Coordination Program for New York, New Jersey, Puerto Rico and the Virgin Islands. A copy of the symposium agenda, as well as available presentations, can be found at www.water.rutgers.edu. For more information, please contact Gregory Rusciano at 732-932-9800 x 6168 or at greg.rusciano@rutgers.edu.

### Features



### The Director's Chair

Joan G. Ehrenfeld, Ph.D

I will be leaving as Director of the NJ WRRI as of January 1, and handing this position over to Dr. Chris Obropta. It is fitting that this issue thus highlights the use of rain gardens for urban stormwater, a subject that Dr. Obropta has done much to promote. The NJ WRRI will be in good hands under his leadership.

# An Introduction to Rain Gardens

*Christopher Obropta, Ph.D., William J. Sciarappa, Ph.D., and Vivian Quinn, Rutgers NJ Agricultural Experiment Station*

What is a Rain Garden?

A rain garden is a landscaped, shallow depression that allows rain and snowmelt to be collected and seep naturally into the ground. This helps recharge our groundwater supply and prevents a water quality problem called polluted runoff (nonpoint source pollution). Rain gardens are an important way to make our cities and neighborhoods more attractive places to live while enhancing ecological health.

Benefits

Having a rain garden in your landscape will reap much more than what is easily visible. During a heavy rainstorm much of the water quickly washes into streets from sidewalks, parking lots, and lawns. It then goes down stormdrains and eventually ends up in local water bodies. What you don't see washing away with the rain water are pollutants such as pesticides, fertilizers, and petrochemicals, which may have accumulated on lawns, driveways, and streets. A shallow depression in the lawn to capture stormwater allows this water to penetrate and move into the ground instead of running off and down into the stormdrain. As the captured water slowly percolates into the ground, pollutants are filtered out, nutrients are used by the plants, or pesticides are broken down by microorganisms. Minimizing runoff into stormdrains also results in decreased sediment, flooding, and shoreline damage. Compared to a conventional lawn, rain gardens allow 30% more water to soak into the ground. Because rain gardens are landscaped, they add beauty to a lawn and create a habitat for birds, butterflies, and beneficial insects.

Getting Started

For best plant establishment and easier digging as a result of spring rains, start the actual construction in the spring. A summer start will work but you may need to water the plants more often until they are established. The first important step is to observe your property during heavy rains, noting where puddles are forming, which areas are not draining well, and where runoff is flowing, especially from the downspouts. Next proceed to pinpoint an exact site and decide on the size and depth required for success.

Site Selection

Rain gardens can be located near downspouts to intercept only roof runoff, placed to collect water from lawn and roof, or along driveways and sidewalks. The topography of your property and where runoff flows will help determine the exact site. Locate an area without existing ponding with a slope between 1% and 10% that is at least 10 feet from the house foundation. Area should not be directly over a septic system. Good soil drainage is important. Determine how fast the soil drains at your site by doing a percolation test. Dig an 8 inch hole and fill with water to saturate soil. Once water has drained, refill with water. If hole completely drains within a few hours, you are assured the area is suitable. Full sun or partial sunlight will allow widest selection of plants, but part shade with the proper plant material will also work (Diagram 1).

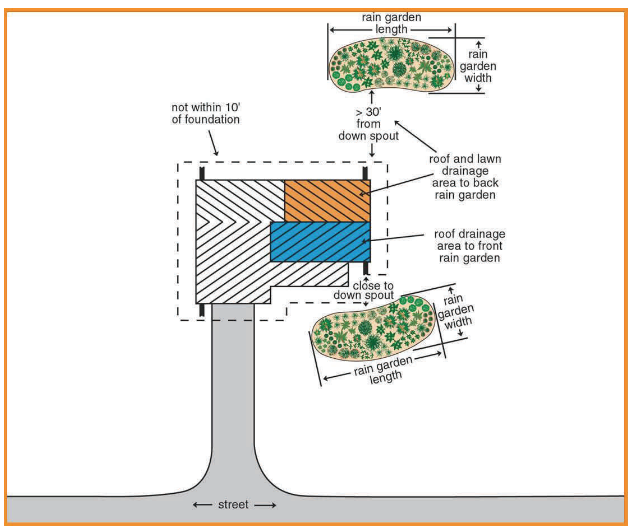



Diagram 1. from Wisconsin Department of Natural Resources. http://clean-water.uwex.edu/pubs/pdf/home.rgmanual.pdf.

Before You Dig

Avoid damaging underground water, gas, and electrical services. Contact New Jersey's "One Call" system at 1-800-272-1000 for a free markout of underground gas, water, sewer, cable, telephone, and electric utility lines before any outdoor construction or digging. Making this call before you dig will help prevent property damage and potential injuries. Experiment with shapes by using rope to lay out boundary of garden. Next think about the landscape plan and which shrubs, grasses, and flowers to plant.

Size and Depth of the Rain Garden

The size of the garden is a function of volume of runoff to be treated and recharged and the soil texture on the site. Garden areas are typically 100–300 sq. ft. and depend on your soil type. Identify your soil as sandy, silty, or clayey. A clay soil will have slow percolation rate and will require a larger garden than one located in a sandy or silty soil. Size the garden to treat all the runoff from a 1.25 inch rainfall event; 1.25 inches of rain over two hours is the NJ water quality storm standard. If treating 1,000 sq. ft. of roof runoff for the 1.25 inch rainfall event, you need a garden that can hold 100 cu ft. of water. If space is limited, this can be a garden that is 10 ft x 10 ft x 1 ft deep. With larger areas, 10 ft x 20 ft x 6 in. deep works equally well. A garden of this size will treat approximately 90% of yearly rainfall. If your property has space limitations, consider multiple smaller rain gardens.

Conclusion

In New Jersey, 90% of rainfall events are less than 1.25 inches, with approximately 44 total inches of rain per year. The rain garden will treat and recharge 0.9 x 44 inches = 40 inches per year = 3.3 ft. per year. If the rain garden receives runoff from 1,000 sq. ft., total volume treated and recharged is 1,000 sq. ft x 3.3 ft = 3,300 cubic feet, which is 25,000 gallons per year. Build 40 of these gardens in your neighborhood and we have treated and recharged 1,000,000 gallons of water per year.

For more information, please visit the Rutgers Water Resources Program Rain Garden Web Page at www.water.rutgers.edu/Rain_Gardens/RGWebsite/raingardens.html. This article is excerpted from "Rain Gardens, Rutgers Cooperative Extension Fact Sheet #513, February 2006." http://water.rutgers.edu/Rain_Gardens/fs513.pdf.

# Bioretention— Lessons Learned for Successful Designs

*Larry S. Coffman, LNSB, LLLP Environmental Services Group*

Throughout the country, bioretention has become a staple treatment practice in the stormwater management industry. Using bioretention techniques, it is possible to transform dysfunctional urban landscapes into aesthetically pleasing, cost effective, ecologically functional features which improve water quality and reduce runoff volume. On-going research by several universities, including Maryland[1], North Carolina State[2], Rutgers[3] and New Hampshire[4], has clearly documented the effectiveness of bioretention. Nationally, an enormous amount of practical design experience has been gained to effectively use the practice in all climates, soils and hydrologic regimes.

Residential application of bioretention (rain garden), courtesy of Metropolitan Council Twin Cities area, Minnesota.

Despite the wealth of research and practical experience gained on optimizing bioretention, the stormwater industry as a whole has been slow to embrace design improvements, resulting in predictable failures (e.g. poor drainage) and performance variability (e.g. pollutant export rather than retention). The biggest roadblocks to change are: 1) codification and continued use of outdated bioretention design standards, 2) regulators rigidly enforcing outdated design standards and discouraging innovation, and 3) few effective outreach venues to educate the industry on design improvements.

Current research and experience shows there are a few simple design modifications that can be used to minimize costly failures. These measures are discussed below.

**1. Don't Use Geo-fabrics.** Unfortunately, most jurisdictions still follow outdated versions of the 1993 P.G. County or 2000 State of Maryland bioretention design guidance that predate current research and fail to recognize current practical experience (Figure 1). The most important issue for success is ensuring the media is well drained by avoiding the use of geo-fabrics between the under drain system and the engineered media. Experience has shown that regardless of the type of geo-fabric used it will likely clog, becoming the primary failure point. A better option is to use a bridging stone or small pea gravel between the under drain and media. The bridging stone limits the migration of media into the under drain without clogging.

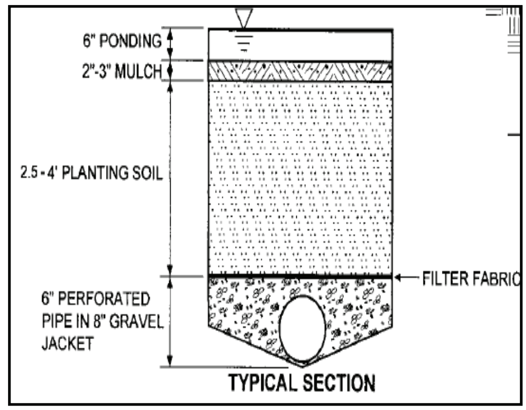



Figure 1. Outdated design standards. Maryland Department of Environmental Resources. 2000 Stormwater Design Manual.

**2. Standardize the Media.** Most media specifications allow too much organic matter, clay and silts causing poor drainage and excessive ponding. Generally, the amount of organic matter in the media should range between 5% and 15% by volume. Peat moss or a well-cured mulch is a good source of organics. Silts and clays should be limited to less than 5% by volume. Figure 2 shows a typical particle size distribution for a well drained high flow media.

Further, media testing should be required to ensure consistency with standards and to ensure it is not contaminated with heavy metals, nitrogen or phosphorus. For example, the media should have a low Phosphorus Index[5] (PI) to ensure it has uptake capacity. If the PI is too high, the media could export phosphorus.

| Engineered Media Particle Size Distribution by Volume |
|---|
| Peat 15 to 20% by volume |
| Clay <5% (<0.002 mm) |
| Silt <5% (0.002-0.05 mm) |
| Very Fine Sand 5-10% (0.05-0.15 mm) |
| Fine Sand 15-20% (0.15-0.25 mm) |
| Medium to Coarse Sand 60-70% (0.25-1.0 mm) |
| Coarse Sand 5-10% (1.0-2.0 mm) |
| Fine Gravel <5% (2.0-3.4 mm |

Figure 2. Particle size distribution for a high flow media. Filterra Advanced Bioretention Systems.

**3. Use Actual Media Flow Rate.** The flow rate through the media is critical to proper sizing of a bioretention cell. A low flow rate requires a large surface area to control the target volume. Generally, published flow rates are too low, such as 0.5 ft/day (MD DER 2000) (Figure 3). The MD DER flow rate is not based on actual media testing, but rather Maryland's minimum infiltration rate, therefore it bares no relationship to actual media flow rate. The sand media specification should be tested by the regulatory agency to determine an actual flow rate for proper sizing.

| Typical Media Design Flow Rate ("K" factor) | |
|---|---|
| Sand | 3.5 ft/day (City of Austin, TX, 1999) |
| Bioretention Soil | 0.5 ft/day (Claytor and Schueler, CWP, 1996) |

Figure 3. From the Maryland Department of Environmental Resources. 2000 Stormwater Design Manual.

**4. A Good Maintenance Plan is Better than Pretreatment.** Pretreatment is not the answer to long-term maintenance needs. Pretreatment has not been shown to significantly extend the life of the practice. It only adds unnecessary costs and greatly restricts the use of the technology (e.g. limited space for pretreatment in urban settings), see Figure 4. There must be a long-term enforceable maintenance plan that clearly identifies the responsible party, requires reporting and accountability and spells out required maintenance activities. This plan needs to be part of and included in the permitting process.

*Continued on page 4*

# Current Research at EPA's Urban Watershed Research Facility

*M. Borst, T. O'Connor, A. Selvakumar, E. Stander, and A. Rowe, U.S. Environmental Protection Agency*

For decades, communities throughout the United States have installed a variety of stormwater controls as part of overall stormwater management plans. Engineers crafted the early plans to assure fast, efficient stormwater runoff routing with an emphasis on both local and downstream flood control. With time, stormwater management matured to include considerations of water quality and flow attenuation while continuing to provide flood mitigation. The communities augmented the plans to incorporate water quality considerations to improve the receiving water condition. Despite the national investment in stormwater management controls, the states' biennial reports continue to show many receiving waters fail to meet the designated use criteria. This failure to meet fully the fishable and swimmable goals of the Clean Water Act prompts EPA to consider the performance of the controls individually and collectively.

The literature includes many evaluations of structural management alternatives designed and installed to protect and restore water quality. Reviewing these field evaluations shows a wide variation in the reported structural control performance. This variation in reported performance, which can span orders of magnitude, makes transferring the findings across applications difficult. EPA undertook several simultaneous approaches to understand the performance and the sources of variation in the measured performance. One approach created a database of performance measurements from selected controls to detect overall estimates and trends. EPA also began targeted evaluations of carefully selected controls to understand better the sources of variations in performance. These complimentary efforts helped direct future research direction.

A key finding from the intense monitoring program was that in most circumstances the stormwater control design did not facilitate monitoring. The design did not consider performance monitoring making it difficult to quantify the performance once built. The uncertainty in weather forecasts and other logistical issues further complicate monitoring measurements. Infiltration-based management actions, by design, lack a measurable effluent under conditions that span much of the normal range leading to performance based on an estimated influent and presumed effluent. A field-monitoring program depends on naturally-occurring runoff with the variability associated with rainfall and antecedent conditions. Relying on runoff from stochastic rain patterns effectively precludes experimental replication needed for valid statistical analysis. Field monitoring programs are very expensive and difficult to execute.

An alternative to relying on field monitoring programs to measure the performance of a given control is designing and constructing stormwater controls specifically for controlled-condition evaluation. The constructed stormwater control needs to be an appropriate scale to provide real-world results. The site needs a stormwater supply that reasonably represents the environmental stressors encountered in other locations in the needed quantity. The National Risk Management Research Laboratory (NRMRL) maintains a facility on EPA's Edison Environmental Center that meets these needs and provides four-season weather in a safe, secure work area.

The Edison, NJ research facility includes multiple controls that EPA plans to evaluate during the next several years. Practitioners and regulators alike agree on the critical need for long term (five to ten years) monitoring to understand the capabilities and limitations of management controls, performance changes with time, and effects of maintenance activities on performance. NRMRL is beginning to collect the needed data on rain gardens, permeable parking surfaces, swales, constructed wetlands and green roofs. The unique Edison facility is documenting the capabilities of the controls to reduce stressor loads and to attenuate flow. NRMRL incorporated instrumentation and sample collection as part of the design to enable easier and better information collection.

*The authors are members of the Urban Watershed Membership Branch at the US EPA National Risk Management Research Laboratory, Edison, New Jersey.*

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*Continued from page 3*

Finally, other issues not related to design standards also need close attention including: 1) the need for certification programs for all vendors that supply media, plants or maintenance, 2) proper construction supervision and inspection is critical to success, and 3) ongoing education of all parties responsible for design, construction and maintenance must be provided. Bioretention can be one of our most effective tools in stormwater management provided there are ongoing efforts to stay current with and encourage innovation and technology advancements.

Ultra urban application of bioretention, courtesy of Filterra Advanced Bioretention Systems.

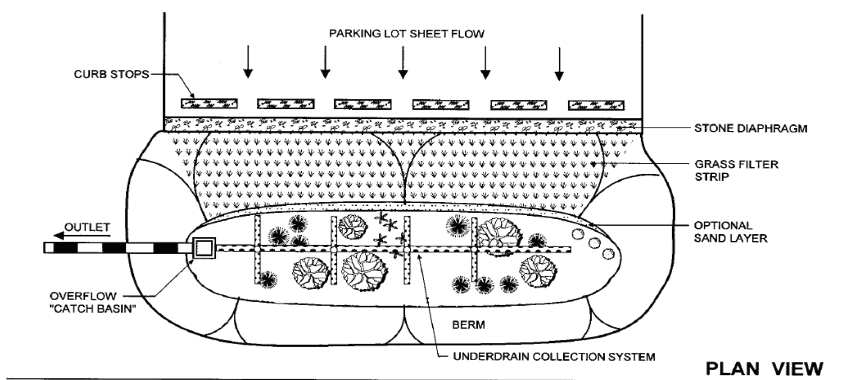


Figure 4. Pretreatment only increases costs and has not been shown to extend useful life. Maryland Department of Environmental Resources. 2000 Stormwater Design Manual.

*Larry S. Coffman has over 35 years of experience in urban stormwater management, water resources protection, and environmental restoration. He pioneered the practice of Bioretention or "Rain Gardens" and was the principal author of the nation's first Low Impact Development (LID) design manual with Prince George's County, Maryland. He was one of the founding members of the non-profit Low Impact Development Center, Inc and is consider one of the nation's leading experts on LID stormwater technologies. He currently operates his own environmental consulting firm specializing in LID educational services.*

# Promoting Nitrate Removal in Rain Gardens

*Emilie K. Stander and Michael Borst, U.S. Environmental Protection Agency*

Rain gardens are vegetated surface depressions, often located at low points in landscapes, designed to receive stormwater runoff from roads, roofs, and parking lots. The gardens' sandy soils allow stormwater to drain quickly to the native soils below and eventually to groundwater. The rain garden vegetation and soils remove pollutants and nutrients from stormwater runoff through biological and physical processes such as plant uptake and sorption to soil particles. In comparison with stormwater release to receiving waters through conventional storm drain systems, infiltrating stormwater through rain gardens reduces peak flows and loadings of both pollutants and nutrients. This reduction improves the physical and biological integrity of receiving streams by reducing stream bank erosion and negative effects on stream communities.

While local governments and individual homeowners are building these systems, relatively few scientific studies have documented the ability of rain gardens to remove pollutants and nutrients. This U.S. EPA long-term research project investigates: 1) the performance of rain gardens in removing pollutants, and 2) whether currently-accepted design standards can be adjusted to improve nitrate removal capabilities.

Typical rain garden designs provide large removals of pollutants of concern, including heavy metals, phosphorus, total nitrogen, and ammonium. The gardens have been less successful in removing nitrate, an important contributor to downstream water quality degradation. A possible explanation for this pattern is that the currently-accepted rain garden design inhibits microbial processes that convert nitrate to nitrogen gas, which is released to the atmosphere, thus keeping the nitrate out of the groundwater and receiving streams. These microbial organisms require wet conditions and a readily-available source of carbon to drive the reaction. Rain gardens' sandy soils drain quickly and have low levels of available carbon, creating poor conditions for these microbes.

U.S. EPA's research is investigating various soil carbon amendments and wet conditions in deep soils in rain gardens to increase nitrate removal. Experiments include adding unprinted newspaper to the soil as a carbon source and a wet zone to deep soils. Nitrate concentrations in water draining from these rain gardens will be compared to concentrations draining from gardens that do not have these features. If this research shows that these features are successful in reducing nitrate concentrations, recommendations will be provided to include those features in rain garden design.

*Emilie K. Stander and Michael Borst are members of the Urban Watershed Membership Branch at the US EPA National Risk Management Research Laboratory, Edison, New Jersey.*

# Designing Urban Retrofits: Getting as Much as You Can with Available Sites

*William Lucas, Griffith University, Queensland, Australia*

This research evaluated the design of two bioretention/infiltration systems using Design Storm (DS) methods, using HydroCAD 8.5. One project involved the design of bioretention systems in Springfield Township, Delaware County, Pennsylvania (PA). These facilities were fingerprinted into areas comprising less than 1% of the contributory drainage area of 38 acres. Treated runoff was then conveyed into a series of infiltration galleries located under a grass field. The high surface to volume ratio of the galleries provides substantial recharge volumes even in slowly infiltrating soils. The other project involved a major retrofit of an interchange of the Garden State Parkway and Route 72 in Manahawkin, New Jersey (NJ). In addition to runoff from a new shopping center, runoff from a half mile of Route 72 and the northbound ramps of the Parkway were conveyed to a series of bioretention systems, some of which were located very close to groundwater. The total area treated by the systems exceeded 55 acres.

To represent the bioretention facilities, each bioretention facility was subdivided into 3 nodes: a surface ponding node, a media node, and an underdrain/stone node. Flows into the surface nodes are allocated as exfiltration into the media, with the surplus routed to surface discharge. Flows pass through the media nodes and into the stone nodes, from which some is exfiltrated, and the balance conveyed into the underdrains. In the PA project, underdrain flows then enter the infiltration gallery nodes. Outflows from these nodes are allocated by rating curves computed according to wetted area and projected exfiltration rates, which varies according to saturation status in the case of the media. In both projects, adaptive management of the system is provided by controllable outlets from the underdrains. System discharge can thus be modulated in response to observed infiltration rates as the system matures.

In the 3.8 cm DS event which occurs roughly twice a year, the PA bioretention systems with infiltration galleries provided infiltration volumes over 60%. Virtually the entire runoff was infiltrated in the NJ project, since the native soil infiltration rates are ten times that in PA, and more room was available for the retrofits. Used in this manner, DS models can provide dynamic routing of infiltration to optimize the performance of these systems.

We then compared Continuous Simulation (CS) to the DS methods in the design of these bioretention/infiltration systems. Results from the DS model were compared to SWMM 5.0.13, the latest version of a state-of-the-art CS model. The systems were modeled using the same node design parameters for both models. Runoff from the DS model was based upon the Curve Number method, while runoff from the CS model was based upon the Green-Ampt formulation. The DS volume reductions for the half-year recurrence event were slightly more than that projected by CS computations applied to 16 years of precipitation. This suggests that relationships derived from CS modeling using local precipitation patterns can be used to establish infiltration and treatment volume criteria for DS models. In this manner, the power of CS models can be used to establish criteria for DS models, which are not only widely used by the design community, but are also very familiar to the regulatory community.

*William Lucas is a doctoral candidate at the Research Higher Degree Program, Griffith University, Nathan Campus, Queensland, Australia.*

# Stormwater Management in Your Backyard: An Extension Program for Homeowners and Master Gardeners

*Madeline Flahive DiNardo, Rutgers NJAES—Cooperative Extension of Union County*

The term "Stormwater Management" may conjure up images of large public works or development projects to the average citizen, when in fact residential property owners can take actions to impact the quality of their communities' groundwater resources.

The Rutgers "Stormwater Management in Your Backyard" (SWMIYB) program, developed by Dr. Christopher Obropta, Specialist in Water Resources, was created to show residential property owners how they can contribute to their communities' best management practices for stormwater management. The program was piloted in Union County, NJ in 2005 with the Rutgers Cooperative Extension Master Gardeners of Union County. The author recruited 31 volunteer Master Gardeners to participate in four, two-hour sessions which covered the principles of stormwater management, best management practices, "backyard" advice, and rain garden installation and maintenance.

In return for the training sessions, Master Gardeners installed four public rain gardens in the fall of 2005, with assistance from local public works departments, Rutgers Water Resources Program staff and the Rahway River Association. The gardens are located at: Walnut Avenue Elementary School and Hanson Park in Cranford, NJ; Fanwood Public Library, Fanwood, NJ; and the Woodbridge Health Department, Woodbridge, NJ. The rain gardens were funded by a NJ Department of Environmental Protection grant.

Professional landscapers learn about rain garden installation first-hand as they plant a demonstration rain garden at the Union County Vocational Technical School in Scotch Plains, NJ.

The success of the pilot SWMIYB program led to training offers for Master Gardeners and community organizations in eight other NJ counties. The training included the installation of 13 demonstration rain gardens, and four which are in progress.

In 2006 and 2007, education programs for the general public were held at the demonstration sites in Union County. The goal was to encourage residents to plant rain gardens. Through these programs, participants increased their knowledge of components and proper depth of a rain garden, care of native grasses and the limited use of fertilizers in rain gardens. Pre- and post-program evaluations showed that participants' scores improved by an average of 13%.

A follow-up survey of Union County Master Gardeners and residents who attended the SWMIYB programs identified another audience for training – professional landscapers. Reasons that participants gave for not installing rain gardens included poor drainage on their property and not being physically capable of planting a rain garden. Professional landscapers would have the knowledge and equipment needed to install rain gardens.

The need for a landscape professionals training program and an opportunity to expand the SWMIYB program in Union County and rural/suburbanizing Gloucester County, NJ, Ulster County, NY and Fredrick County, VA attracted funding for a three year USDA CRESS National Integrated Water Quality Program project.

The first component of the project was offered in winter/early spring 2008. Ninety landscape professionals in New Jersey completed regional "Rain Garden Installation for Landscape Professionals" programs. The programs included five hours of classroom instruction and participation in installation projects. The professionals installed community demonstration rain gardens at the Gloucester County Fairgrounds, Mullica Hill, NJ and Union County Vocational Technical School, Scotch Plains, NJ. Program evaluations showed that 76% of the participants intend to offer rain garden installation services.

Another aspect of the grant is to train Master Gardeners and environmental groups so they install and maintain community rain garden demonstration sites. Master Gardeners and Master Naturalists in Ulster County, NY and Fredrick County, VA learned about basic stormwater management practices, as well as installation and maintenance. The trainees planted rain gardens at the Ulster Municipal Building, Ulster, NY and Hedgebrook Farm in Winchester, VA.

For Years Two and Three of the project, professional landscaper training will be offered in NJ, NY and VA. Master Gardeners will participate in basic rain garden installation training and advanced "train-the-trainer" programs. The volunteers will offer educational programs at the rain gardens planted in 2008 and new sites planned for 2009 and 2010.

To encourage residential property owners to plant rain gardens, a "mini-grant" incentive program will be offered to Master Gardeners and public education program participants in year three of the project. Twenty "mini-grants" of plant materials and soil amendments, five per participating county, will be awarded.

The SWMIYB program has grown from those 2005 winter afternoon training sessions for volunteer Master Gardeners in Union County, NJ to a multi-state educational effort that targets volunteers, residential property owners and professional landscapers. SWMIYB empowers people to improve their communities' groundwater resources.

*Madeline Flahive DiNardo is the County Agricultural Agent, Rutgers NJAES Cooperative Extension of Union County, http://njaes.rutgers.edu/extension/.*

# Implementing and Sustaining a Rain Garden Program at the Local Government Level

*Rusty Schmidt, Washington Conservation District, Washington County, Minnesota*

The 10,000 Rain Garden program in Kansas City, MO was started to educate citizens about stormwater impacts to the city and the larger combined sewer overflow (CSO) problem. The CSO problem will eventually cost the city several billion dollars to repair, as it will in many other older cities. The mayor wanted to educate the public prior to asking for bonds to build the large underground tunnels necessary to fix and mitigate the CSO's. The educational campaign focused primarily on television ads and resulted in a 50% increase in understanding about stormwater within the city after just six months. Prior to submitting the plan to the US Environmental Protection Agency, the city looked at alternative green solutions to help mitigate the CSO's. This change occurred because of the public outreach and education associated with the rain garden program. Other cities, such as Cincinnati and Toledo, OH, and Lexington, KY, are using the messages and campaigns that were successful in Kansas City to start programs of their own.

The Twin Cities metro area of Minnesota has also implemented programs to protect water quality with rain garden initiatives. One of the programs introduced was the Blue Thumb program. This program is a partnership of local governments, nurseries, landscapers, and designers providing tools for local citizens to "Plant for Clean Water". Tools within the program are step-by-step directions on how to plant rain gardens, native gardens or shoreline stabilization projects. Many of the governmental partners provide different types of cost-share grants that have become very successful in promoting rain gardens and other stormwater Best Management Practices (BMPs). In Washington County alone, 92 projects were completed in 2008.

Professionals at a "Stormwater U" class.

The program also provides training programs for nurseries and landscapers so that all of the partners are informing the public similarly. In return, the partners have developed literature in brochures, plant tags for nurseries, "The Blue Thumb Guide to Raingardens" book, videos, and a media and marketing campaign. Marketing has included television spots on local news channels, billboards, and booths and materials to pass out at expos, home and garden shows, and other fairs. This program has become very popular and has been receiving a lot of local attention and honors. Please check out the program at www.bluethumb.org.

There are many ways for municipalities to promote rain gardens. The city of Maplewood, MN builds rain gardens into all street improvement projects. This approach has had positive results by keeping costs and assessments lower for each homeowner that volunteers to maintain a garden provided by the city. The program has been running for 12 years with 450 gardens along its roads. (Check out this program by searching for "Maplewood, MN, rain gardens".) In Plymouth, MN, the city has made stormwater BMP tools a requirement for new and re-development. This has also been very successful over the last five years with rain gardens being the tool of choice in most developments. Minneapolis has created an incentive program to promote rain gardens by giving a credit on the city's stormwater utility fee. This is the only utility fee credit that has been successful for the average homeowner as well as the larger development, mall, church or school. You can check out this program on the Minneapolis Stormwater Fee webpage: www.ci.minneapolis.mn.us/stormwater/fee/.

There are also rain garden training programs for citizens occurring in the Twin Cities area. In addition to the Blue Thumb program, there is the Metroblooms program at www.metroblooms.org. This non-profit program educates around 2,200 citizens each year about rain gardens and how to build them. The program's follow-up research shows that about 20% of the citizens that attend these workshops build rain gardens the first year and 50% by year two. The workshop focuses on the methods and steps to build a rain garden, which are simple, easy to understand and focused on a successful outcome. The "Blue Thumb Guide to Raingardens" is an example of the workshop outline.

Another training program that goes beyond the homeowner are the "Stormwater U" classes offered by University of Minnesota Extension. These educational workshops are for professionals to learn about different aspects of stormwater BMPs. Recent training sessions have included advanced training for engineers and landscape architects on infiltration practices, planners and the comprehensive planning process, landscapers and nurseries on how to have a dialog between designer and contractor, and maintenance of infiltration practices and ponds. Visit www.extension.umn.edu/stormwater/ for more information.

As further support for the value of rain gardens to the community, a very successful study was conducted in Burnsville, MN. This study was a long-term paired watershed study to show the quantity of water that rain gardens could influence. The paired neighborhoods directed flow of water to a pair of catch basins. These catch basins were fitted with monitoring equipment and studied for two years. One neighborhood received 17 rain gardens as a retrofit project, and the catch basins were monitored for an additional three years. The study showed that the neighborhood that received rain gardens reduced the amount of water entering the catch basins by 83% the first year, 90% the second and 93% the third year of the annual rainfall. However, more importantly, the gardens added aesthetic value and were admired by homeowners, creating another positive effect for the neighborhood and watershed.

*Rusty Schmidt is a Natural Resource Specialist with the Washington Conservation District in Stillwater, Minnesota. http://www.mcwcd.org/.*

# Conference Calls

**2009 USDA-CSREES National Water Conference**

February 8-12, 2009 in St. Louis, Missouri

For more information, please visit http://www.usawaterquality.org.

**Managing Water Resources and Development in a Changing Climate**

May 4-6, 2009 in Anchorage, Alaska

For more information, please visit http://www.awra.org/meetings/Anchorage2009/index.html.

**World Environmental & Water Resources Congress**

May 17-21, 2009 in Kansas City, Missouri

For more information, please visit http://content.asce.org/conferences/ewri2009/

**Water Policy 2009**

June 22-26, 2009 in Prague, Czech Republic

For more information, please visit http://www.fzp.czu.cz/waterpolicy2009/index.php.

For upcoming conferences, events, and training sessions in New Jersey and beyond:
http://njwrri.rutgers.edu/events_list_page.htm

# New Jersey Flows

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