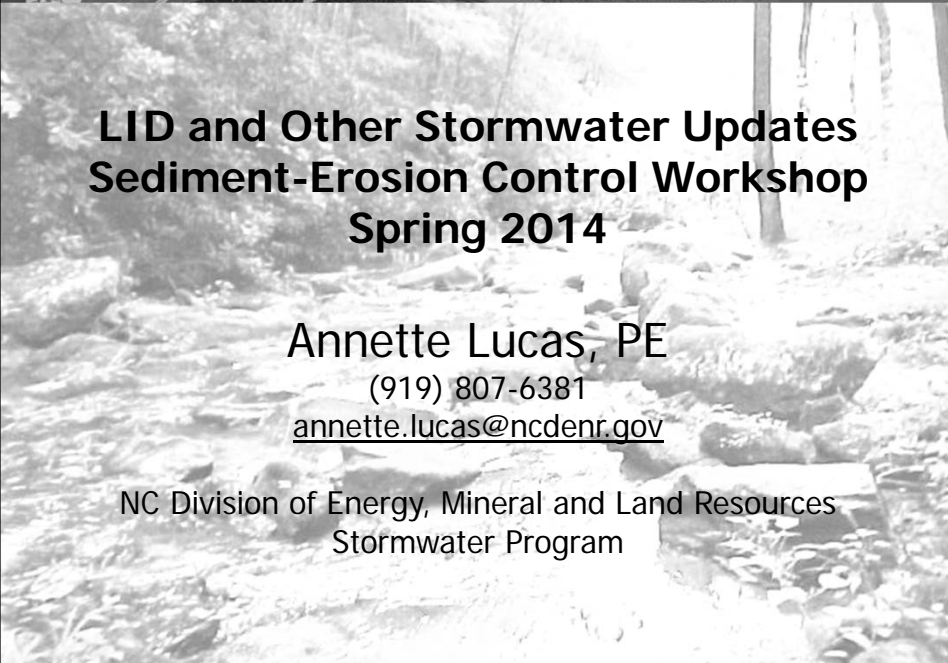


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## LID and Other Stormwater Updates Sediment-Erosion Control Workshop Spring 2014

Annette Lucas, PE  
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NC Division of Energy, Mineral and Land Resources  
Stormwater Program

Division of Energy, Mineral and Land Resources



## Today's Webinar:

**First 25 minutes:**

- Low Impact Development & Storm-EZ
- BMP manual updates

**Last 25 minutes:**


- Technical Review Workgroup Products
- Minimum Design Criteria Team
- Temporary gravel rule

Image: NC LID Guidebook



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**Whole Foods,  
North Raleigh**  
Discharges LESS  
after development  
than before.




Photos: [www.sandec.com](http://www.sandec.com)

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**NC LID Guidebook definition:**

LID creates a landscape that mimics  
the natural hydrologic functions of  
infiltration, runoff, and  
evapotranspiration.




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**A development is LID when:**

1. Pre- & post- development rainfall fates (based on volume) are a close match for the 90<sup>th</sup> percentile storm event.
2. The integrity of surface waters is maintained (hydrology, flows and structure).

Photo: NC LID Guidebook



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**What are “RAINFALL FATES?”**

Before development, there are **two** rainfall fates:

1. Runoff
2. LI fates: Infiltration, ET, Evaporation  
Post-filtration discharge (bioretention)  
Re-use from a cistern



After development, we add a **third** fate:

3. Treated runoff (wet pond/wetland)

Photo: [www.nowiknow.com](http://www.nowiknow.com)



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### The "Conventional" Approach: All SW directed via pipes to a wet pond

<p><b>Before:</b></p> <p>Runoff + <b>Infiltration, ET, Evaporation</b></p>	
	<p><b>After:</b></p> <p><b>Treated Runoff</b> + Infiltration, ET, Evaporation</p>

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### One way to be LID

<p><b>Before:</b></p> <p>Runoff + <b>Infiltration, ET, Evaporation</b></p>	
	<p><b>After:</b></p> <p>Runoff + <b>Infiltration,</b> ET, Evaporation</p>


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## Another way to be LID

**Before:**  
Runoff  
+  
Infiltration, ET,  
Evaporation




**After:**  
Runoff  
+  
Infiltration




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## Another way to be LID

**Before:**  
Runoff  
+  
Infiltration, ET,  
Evaporation



**After:**  
Runoff  
+  
Infiltration, Post-  
Filtration Discharge,  
ET, Evaporation



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**Step 1: Application Form**  
**Project Name**  
**Designer Name & Firm**

---

**Project Information**

<b>Project Name:</b> _____	<b>Date:</b> _____	
<b>Project address:</b> _____	<b>Lat:</b> _____	
<b>City, ZIP:</b> _____	<b>Long:</b> _____	
<b>Direction to project:</b> _____	<b>County:</b> _____	<b>County/Parish/county:</b> _____
<b>River basin:</b> _____		
<b>Receiving stream(s):</b> _____		
<b>Stream class(es):</b> _____		
<b>Surface water area (ac):</b> _____	<b>Count of land area (ac):</b> _____	
<b>Total property area (ac):</b> _____	<b>Total project area (ac):</b> _____	

Project characterization:  LID  Drains to an off-site stormwater system  
 Low density  Within 575' of Saltwater ORW  
 High density  Within 5 miles of a public airport

Briefly summarize how the stormwater runoff will be treated:

---

**Permit Information**

Status of application: \_\_\_\_\_ Status of construction: \_\_\_\_\_  
 Other permits needed:  Sedimentation/erosion control  404 permit/401 certification  
 CDM master permit  Wetland use/alter permit  
 Threatened/Endangered species  NPDES In-lieu fee/stormwater permit

If an application for this project has been previously returned, provide the original project number and previous name of the project:

Provide the permit type, number and issue date for any permits that have already been obtained for this project:

If claiming vested rights, then identify (and attach) the supporting documents and approval dates:

<input type="checkbox"/> Approval of site-specific development plan or PUD	→	Approval date: _____
<input type="checkbox"/> Valid building permit	→	Issue date: _____
<input type="checkbox"/> Other	→	Date: _____

Local jurisdiction for building permit: \_\_\_\_\_  
 Point of contact: \_\_\_\_\_ Phone number: \_\_\_\_\_

---

**Contact Information**

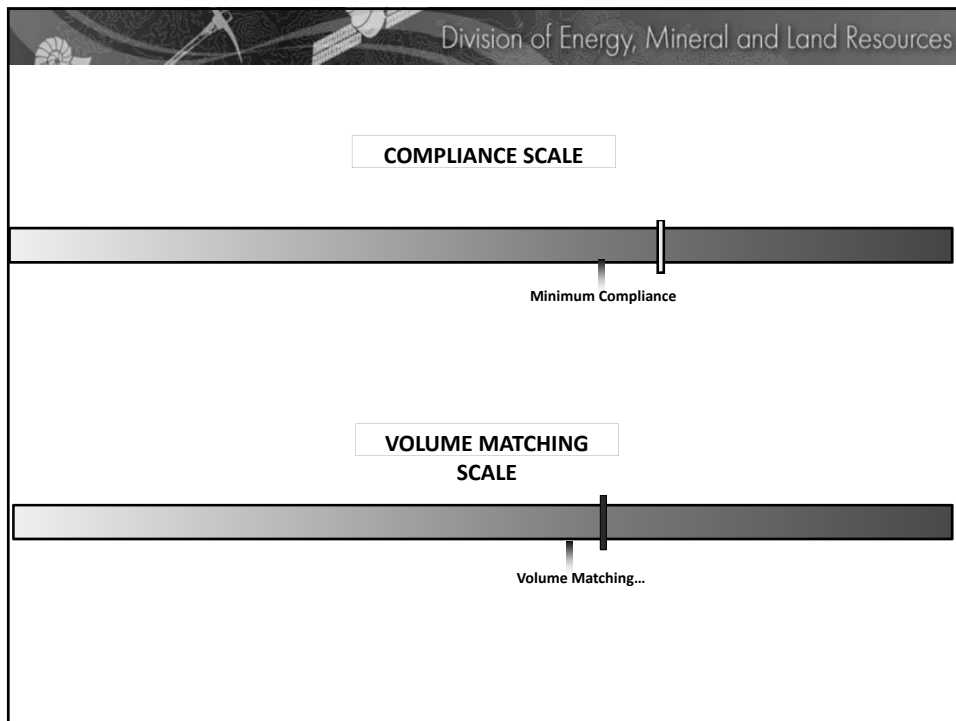
Applicant and Title: \_\_\_\_\_ State: \_\_\_\_\_

Accepts data on pre- and post-dev land uses & SW practices.

Uses SCS Method to calculate pre- and post-development rainfall fates.

Works for both the "treated runoff" approach and LID.

Hunter Freeman, PE, Withers & Ravenel



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**State Department of Environment and Natural Resources**  
**Division of Stormwater Management**

**STORMWATER MANAGEMENT**  
*This form may be used for other purposes.*

**PERMIT INFORMATION**

1. Project Name (subdivision, facility, or other): \_\_\_\_\_  
 2. Location of Project (street address): \_\_\_\_\_  
 City: \_\_\_\_\_  
 3. Directions to project (from nearest major road): \_\_\_\_\_  
 4. Latitude: \_\_\_\_\_ N Longitude: \_\_\_\_\_ W

II. PERMIT INFORMATION:

1. a. Specify whether project is (check one):  
 New construction  
 Existing construction  
 Low Density  
 High Density

2. If this application is being submitted as a permit application, specify the type of permit (check one):  
 Major  
 Minor

3. If any of these permits have already been issued, specify the date and the type of each permit: \_\_\_\_\_

4. Is the project located within 5 miles of a water body?  
 Yes  No

**Stormwater Management**  
**BIORETENTION**

*The Required Stormwater Management (P) Form*

**PROJECT INFORMATION**

Project Name: \_\_\_\_\_  
 Contact Name: \_\_\_\_\_  
 Phone Number: \_\_\_\_\_  
 Date: \_\_\_\_\_  
 Drainage Area Number: \_\_\_\_\_

**DESIGN INFORMATION**

**Site Characteristics**

Drainage Area: \_\_\_\_\_  
 Impervious Area: \_\_\_\_\_  
 Percent Impervious: \_\_\_\_\_  
 Duration of Rainfall Depth: \_\_\_\_\_  
 Peak Flow Calculation: \_\_\_\_\_  
 15' runoff depth: \_\_\_\_\_  
 15' runoff volume: \_\_\_\_\_  
 Pre-development 15' runoff: \_\_\_\_\_  
 Post-development 15' runoff: \_\_\_\_\_  
 Minimum volume required: \_\_\_\_\_

**Cell Dimensions**

Length: \_\_\_\_\_  
 Width: \_\_\_\_\_  
 Surface area of the top of the bioretention cell: \_\_\_\_\_

**Media and Soil Summary**

Drainage time, 60 min: \_\_\_\_\_  
 Drainage time, 120 min: \_\_\_\_\_  
 Drainage time, 240 min: \_\_\_\_\_  
 Infiltration: \_\_\_\_\_  
 Soil permeability: \_\_\_\_\_  
 Filter media depth: \_\_\_\_\_

Permit Number: \_\_\_\_\_  
 (to be provided by DPWR)

**Bioretention Operation and Maintenance Agreement**

I will keep a maintenance record on this B3BP. This maintenance record will be kept in a log in a known set location. Any deficient B3BP elements noted in the inspection will be corrected, repaired or replaced immediately. These deficiencies can affect the integrity of structures, safety of the public, and the removal efficiency of the B3BP.

**Important operation and maintenance procedures:**

- Immediately after the bioretention cell is established, the plants will be watered twice weekly if needed until the plants become established (concomitantly in weeks).
- Shovel, mulch or any other material will NEVER be piled on the surface of the bioretention cell.
- Heavy equipment will NEVER be driven over the bioretention cell.
- Special care will be taken to prevent sediment from entering the bioretention cell.
- Once a year, a soil test of the soil media will be conducted.

After the bioretention cell is established, I will inspect it once a month and within 24 hours after every storm event greater than 1.0 inches (or 1.5 inches if in a Coastal County). Records of operation and maintenance will be kept in a known set location and will be available upon request.

Inspection activities shall be performed as follows. Any problems that are found shall be repaired immediately.

B3BP element	Potential problem:	How I will remediate the problem:
The entire B3BP	Yield/Volume is present	Remove the trash/debris
The perimeter of the bioretention cell	Areas of bare soil and/or visible gullies have formed.	Regrade the area if necessary to remove the gully; and then plant a ground cover and water until it is established. Provide lime and a one-time fertilizer application.
The inlet device: pipe, stone weir or grate	The pipe is clogged (if applicable).	Flush the pipe. Dispose of the sediment off-site.
	The pipe is cracked or otherwise damaged (if applicable).	Replace the pipe.
	Erosion is occurring in the swale (if applicable).	Regrade the swale if necessary to smooth it over and provide erosion control devices such as rock-lined curb missing or riprap to avoid future problems with erosion.
	Stone weir is clogged or covered in sediments (if applicable).	Remove sediment and clogging stone and replace with clean stone.

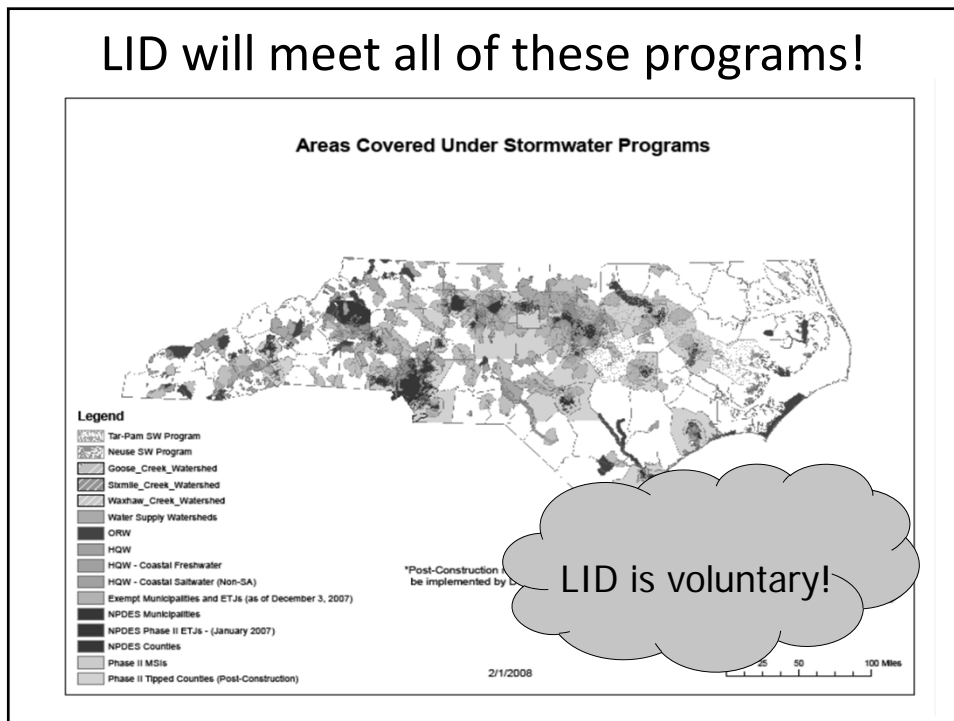





Photo: en.wikipedia.org



2014  
**NC**  
**LID**  
**SUMMIT**  
North Carolina  
Low Impact  
Development  
Summit

March 26-27, 2014  
Raleigh Convention Center  
There are still spaces left!

**NC STATE UNIVERSITY**  
College of Agriculture and Life Sciences | College of Engineering



**Stormwater  
Engineering  
Group**

**Low Impact Development & Storm-EZ  
Technical Workshops**

May 7-8, 2014 – Boone, NC  
May 14-15, 2014 - Raleigh, NC  
May 21-22, 2014 - Wilmington, NC

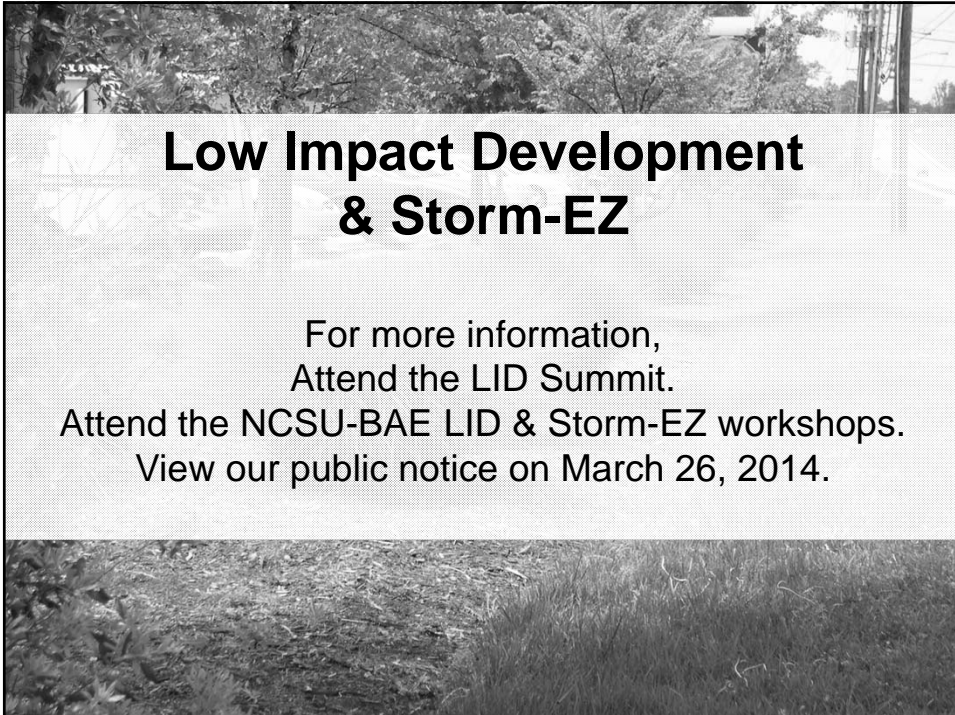
More on the horizon – check the NCSU web site.



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## LID – State Technical Review Team:

Withers & Ravenel  
Red Line Engineering  
Estes Design Group  
Morrisville, Raleigh, Greensboro, Charlotte  
NCSU Stormwater Group  
UNC-Chapel Hill  
Coastal Federation  
American Rivers  
Division of Water Resources  
DEMLR



## Low Impact Development & Storm-EZ

For more information,  
Attend the LID Summit.  
Attend the NCSU-BAE LID & Storm-EZ workshops.  
View our public notice on March 26, 2014.

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HOME Search DENR ... - Text +

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[Back to Stormwater Permitting Homepage](#)

**BMP Manual Errata Sheet**  
Revised 12/5/12

**BMP Manual Chapters**

**Cover Page**

- 1 - Introduction r. 7/2/07
- 2 - NC Stormwater Requirements r. 6/6/09
- 3 - Stormwater Calculations r. 6/16/09
- 4 - Selecting the Right BMP r. 12/5/12
- 5 - Common BMP Elements r. 7/16/09
- 6 - Landscape & Soil Specs. r. 6/17/09
- 7 - BMP Maintenance r. 9/28/07
- 8 - Level Spreader & Veg. Filter Strip r. 3/9/10
- 9 - Stormwater Wetland r. 7/10/09
- 10 - Wet Detention Basin r. 6/16/09
- 11 - Sand Filter r. 9/20/09
- 12 - Bioretention r. 7/24/09
- 13 - Public Airports BMP Toolbox DRAFT
- 14 - Grassed Swale r. 6/8/09
- 15 - Restored Riparian Buffer r. 9/28/07
- 16 - Infiltration Devices r. 7/23/09
- 17 - Dry Detention Basin r. 6/1/09
- 18 - Permeable Pavement r. 10/16/12
- 19 - Rooftop Runoff Mgmt r. 9/28/07
- 20 - Proprietary Systems r. 12/5/12
- 21 - BMP Const. Techniques r. 7/2/07
- 22 - SW Submittal Requirements r. 7/2/07
- 23 - References r. 7/2/07

Appendix A r. 1/22/14  
Appendix B r. 7/2/07  
Appendix C r. 7/2/07

### DWQ Stormwater BMP Manual & BMP Forms

January 22, 2014: Several links in this section are not working as we sort out a website transition issue. We apologize for the interruption, and we are working to correct the problem as soon as possible. Please check back or call a Stormwater Permitting Staff member for assistance. Select from the menu on the left the BMP Chapter, BMP Supplement Form or OBM Agreement that you want to view.

All other forms and documents related to State Stormwater and Post-Construction can be found [HERE](#).


Sign up to receive BMP email updates: [CLICK HERE](#)

[COMMENT ON THE BMP MANUAL & RELATED FORMS](#)

North Carolina  
Division of Water Quality

### Stormwater Best Management Practices Manual

July 2007\*



\*Individual chapters of the BMP Manual will be updated periodically. Individual chapters may be more recent than July 2007.



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## BMP Manual Updates:

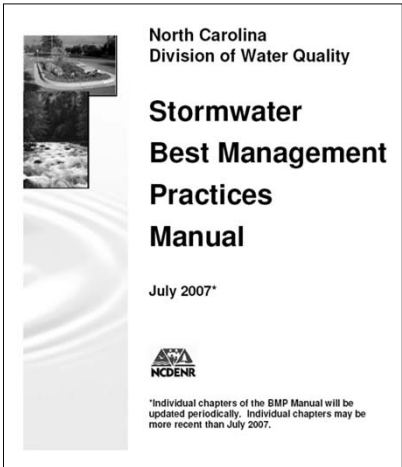
### Disconnected Impervious Surface (DIS) Rainwater Harvesting Green Roof



Photo: NCSU Stormwater Group

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## BMP Manual Updates will provide:



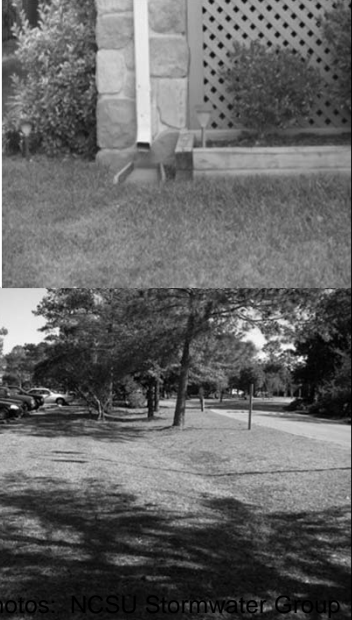
- More options
- More credit
- More infiltration designs

These apply to **both** LID & conventional development.

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## Disconnected Impervious Surface (DIS): (new chapter)

- Two types:
  - Downspout disconnection
  - Pavement disconnection
- Can achieve a range of credit based on the design and soil type.



Photos: NCSU Stormwater Group

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## Downspout Disconnection

- 500 square feet max to downspout.
- 7% max slope with uniform grading.
- Dense lawn with no clumping species.
- Minimum 5-foot distance between foundation & vegetated area.
- Sites must be tilled to eight inches prior to vegetation establishment.


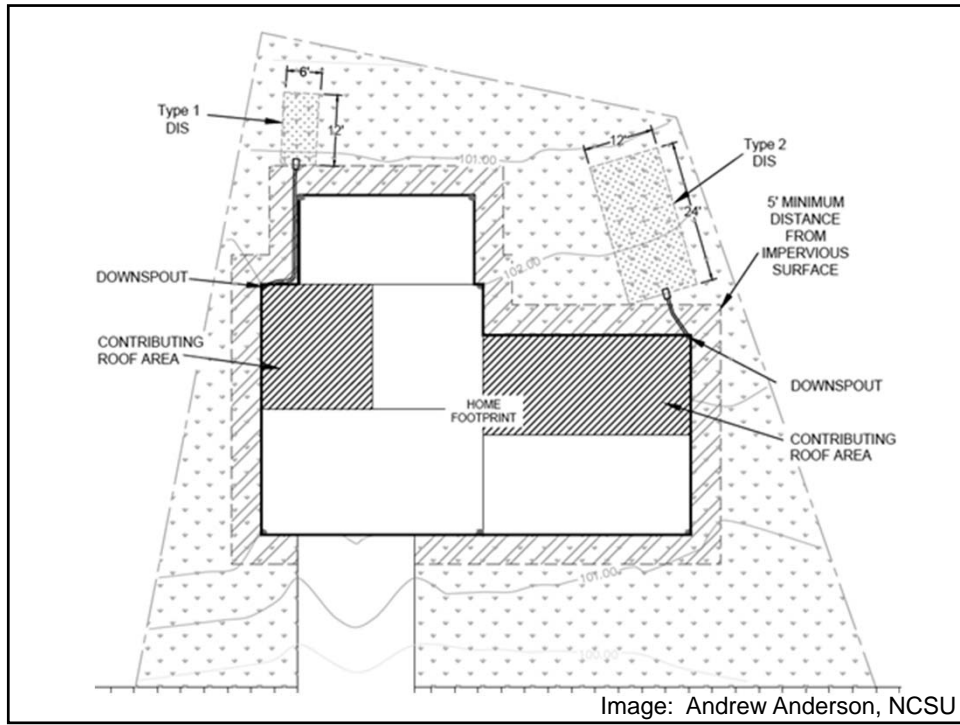



Photo: Natalie Carmen, NCSU



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## Downspout Disconnection

Minimum size	6' wide X 12' long		12' wide X 24' long	
HSG	A/B	C/D	A/B	C/D
Runoff reduction credit	45%	30%	65%	50%



Photos: Natalie Carmen, NCSU

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## Pavement Disconnection

- Maximum of 100 feet to a 10-foot grassed shoulder.
- Gravel or specialized curb slightly lower than road surface to promote drainage and protect pavement edge.
- Maximum slope of 8% for both pavement and shoulder (graded to promote diffuse flow).


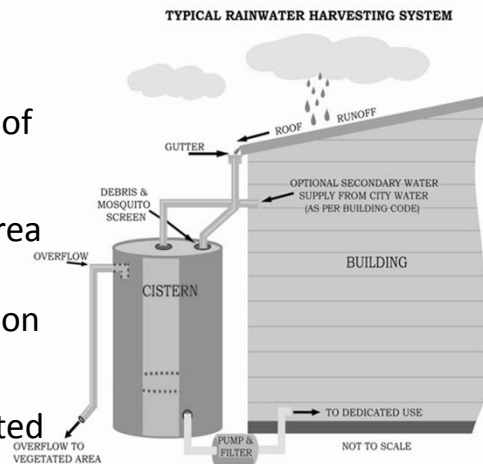


Photo: NCSU Stormwater Group

## Rainwater Harvesting:

- Full 85% TSS reduction
- Rule of thumb: 1 gallon/square foot of roof
- New passive drawdown design to a vegetated area for a SF lot or small infiltration or bioretention for other sites
- Also may have a dedicated use



## Green Roof:

- 85% TSS removal if designed to control the entire design storm
- Credit is based on the depth and plant available water in growing medium



Photos: NCSU Stormwater Group





## **BMP Manual Updates**

For more information,  
Attend the LID Summit.  
Attend the NCSU-BAE LID & Storm-EZ workshops.  
View our public notice on March 26, 2014.

## **Technical Review Team Products**



Photo: [en.wikipedia.org](http://en.wikipedia.org)

## Technical Review Workgroup

- Met from January 2013 to January 2014, usually in Wilmington.
- Included consultants, environmental group, local government, DEMLR and DWR.
- Addressed some specific concerns about the stormwater program.

## Technical Review Group Products:

- ★ 1. Discrete SCS Method for Computing WQV
- ★ 2. Standards for Relaxing the 2-foot Separation from SHWT for Infiltration Devices
- ★ 3. Options for No Direct Discharge to SA Waters
- ★ 4. Definitions of Key Stormwater Terms
5. Alternative Design for Wet Detention Ponds  
*Will be conveyed to the MDC Team*

## Technical Review Team Products

For more information:  
View our public notice on February 28.



## Minimum Design Criteria (MDC) Team



## Minimum Design Criteria (MDC) Team

Members selected by Rep. Millis, PENC and DENR.

Includes:

- Professors
- Engineers
- Local governments
- NC Home Builders
- Assoc General Contractors
- A soil scientist
- Environmental Interests
- DEMLR, DWR, DOT

## Two Tasks of the MDC Team

1. To develop **MDCs** that encompass all requirements for siting, site preparation, design, construction, and maintenance of BMPs. Recommendations regarding MDCs due to the ERC on September 1, 2014.
2. To develop a **fast-track permitting process** for issuing state stormwater permits without a technical review when the applicant complies with the MDCs and the application is prepared by a qualified professional. The EMC shall adopt a fast-track rule by July 1, 2016.

## **Task #1: Develop MDCs**

**MDCs shall protect state water quality standards.**

**Some challenges:**

- 13 different BMPs, each with unique design criteria.
- September 1, 2014 deadline.

**Assets:**

- Existing BMP Manual to use as a starting point.
- Storm-EZ can provide a framework for implementation.
- Knowledge and creativity of team members.

## **Task #2: Develop Fast-Track Permitting Program**

**Required components:**

1. Process for permit application, review, & determination.
2. Process for ensuring compliance with the MDCs.
3. Specification for the qualifications that professionals must have to prepare a fast-track permit application.
4. Process for establishing the liability of professionals who prepares a fast-track permit applications for when the BMPs fail to comply with the MDCs.

## **MDC Team Schedule**

Starts in March 2014

Estimated duration: 18 months

There will be channels for public information and input, the details are still TBD.

## **Minimum Design Criteria (MDC) Team**

For more information:  
Join our stormwater listserv to receive notices.





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**Why is the EMC proposing a temporary rule?**

HB 74 excludes “gravel” from the definition of "built-upon area." The EMC now seeks to:

- Define “gravel” to assist the regulatory community & protect the environment.
- Insure that “gravel” does not include aggregate materials that do not allow water to infiltrate.
- Be consistent with the Unified Soil Classification System (gravel diameter from 0.08 to 3 inches with < 5% fines).

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### What does the proposed temporary rule say?

**Updates the definition of “built upon area” per HB 74.**

**Makes a small change to the definition of “permeable pavement.”**

**Adds a definition of “gravel:”**  
“Gravel” means a clean or washed loose aggregate of small, rounded, water-worn or pounded stones from a lower limit of 0.08 inches up to 3.0 inches in size. Gravel is not crushed stone or rock.









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### How does this affect development projects?

Areas (both new and existing) meeting the definition of "gravel" will be considered as pervious.

Areas (both new and existing) covered in aggregate that does not meet the definition of "gravel" will be considered as impervious.



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### Temporary Rule Schedule


1-15 – 2/7	Public comment period w/hearing on 1/23. Between 30-40 comments (top comments: gradation, terms “rounded, water-worn or pounded,” authority/need for a temporary rule.)
At present	Working with the Hearing Officer to revise the gravel definition. Implementation per the temporary rule for now.
3/13	Revised gravel definition to the EMC
3/17 – 3/21	Temporary rule to the Rules Review Commission



A black and white photograph of a large pile of gravel, used as a background for the text.

**Gravel Temporary Rule:**

For more information, see  
<http://portal.ncdenr.org/web/lr/public-notice>  
Join our stormwater listserv for future updates.

A logo for the Division of Energy, Mineral and Land Resources, featuring a stylized sun and a gear.

Division of Energy, Mineral and Land Resources

**Special Thanks to:**

Hunter Freeman, PE  
Bill Hunt, PhD, PE  
Andrew Anderson, FE  
Natalie Carmen, FE  
Mike Randall  
Julie Ventaloro  
Bradley Bennett

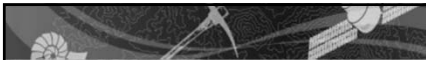


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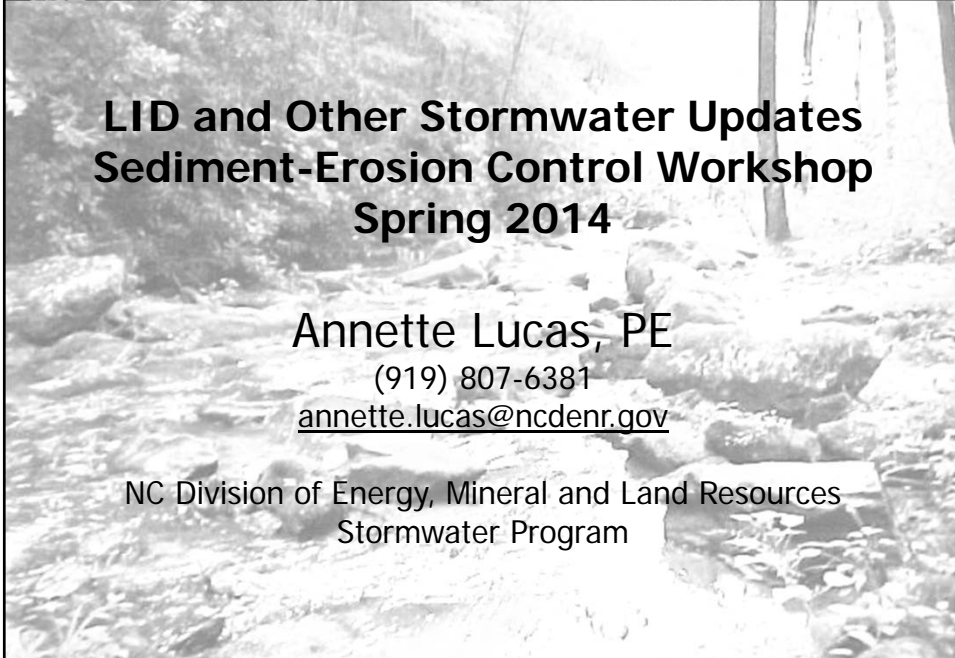
**Quote of the Day:**

**“Spring is the time of plans and projects.”**

- *Leo Tolstoy, Anna Karenina*



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**LID and Other Stormwater Updates  
Sediment-Erosion Control Workshop  
Spring 2014**

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Stormwater Program