Post-Construction Stormwater Runoff Reduction & Minimization: NPDES Permit Requirements & Implementation Strategies

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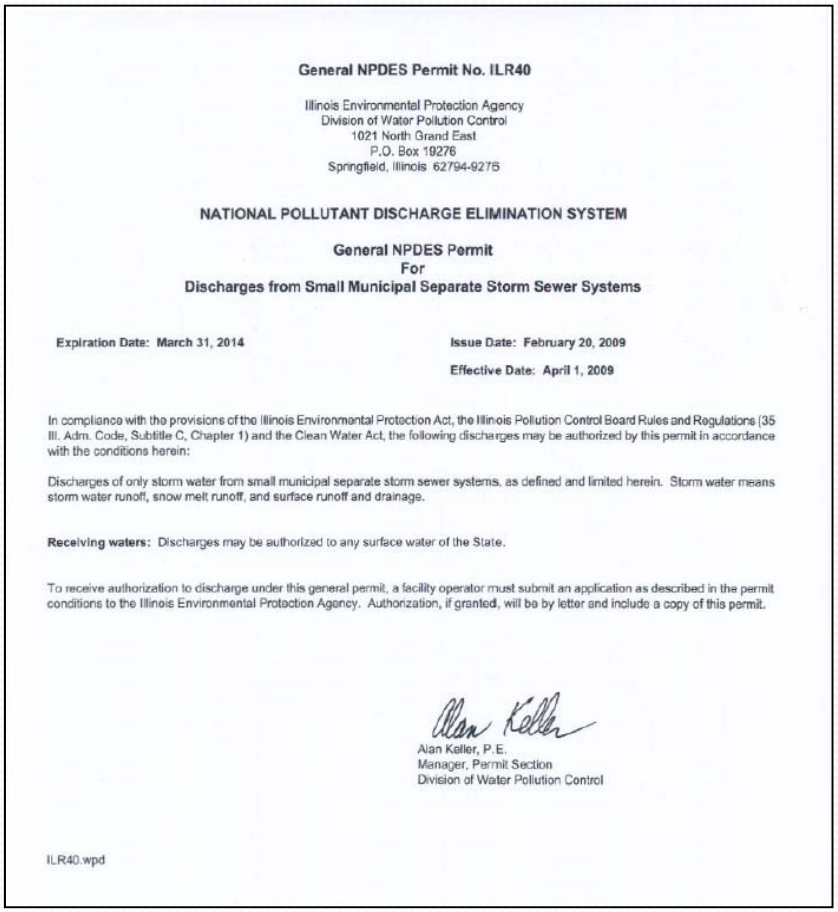
IAFSM
Illinois Association for Floodplain and Stormwater Management

Illinois MS4 General Permit

- Re-issued: February 20, 2009
- Significant changes from the original permit issued in 2002
- Let's take a closer look at MCM 5…



General NPDES Permit No. ILR40

Illinois Environmental Protection Agency
Division of Water Pollution Control
1021 North Grand East
P.O. Box 19276
Springfield, Illinois 62794-9276

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

General NPDES Permit
For
Discharges from Small Municipal Separate Storm Sewer Systems

Expiration Date: March 31, 2014

Issue Date: February 20, 2009

Effective Date: April 1, 2009

In compliance with the provisions of the Illinois Environmental Protection Act, the Illinois Pollution Control Board Rules and Regulations (35 Ill. Adm. Code, Subtitle C, Chapter 1) and the Clean Water Act, the following discharges may be authorized by this permit in accordance with the conditions herein:

Discharges of only storm water from small municipal separate storm sewer systems, as defined and limited herein. Storm water means storm water runoff, snow melt runoff, and surface runoff and drainage.

Receiving waters: Discharges may be authorized to any surface water of the State.

To receive authorization to discharge under this general permit, a facility operator must submit an application as described in the permit conditions to the Illinois Environmental Protection Agency. Authorization, if granted, will be by letter and include a copy of this permit.

Alan Keller, P.E.
Manager, Permit Section
Division of Water Pollution Control

ILR40.wpd

Permit Requirements

PART IV. STORM WATER MANAGEMENT PROGRAMS

A. Requirements

The permittee must develop, implement, and enforce a storm water management program designed to reduce the discharge of pollutants from your small municipal separate storm sewer system to the maximum extent practicable (MEP), to protect water quality, and to satisfy the appropriate water quality requirements of the Illinois Pollution Control Board Rules and Regulations (35 Ill. Adm. Code, Subtitle C, Chapter 1) and the Clean Water Act. Your storm water management program must include the minimum control measures described in section B of this Part. For new permittees, the permittee must develop and implement a program by the date specified in your coverage letter. The U.S. Environmental Protection Agency's National Menu of Storm Water Best Management Practices (http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm) and the most recent version of the Illinois Urban Manual should be consulted regarding the selection of appropriate BMPs.

B. Minimum Control Measures

The 6 minimum control measures to be included in your storm water management program are:

5. Post-construction storm water management in new development and redevelopment

The permittee must:

a. develop, implement, and enforce a program to address and minimize storm water runoff from new development and redevelopment projects that disturb greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale or that have been designated to protect water quality, that discharge into your small MS4 within the MS4 jurisdictional control. Your program must ensure that appropriate controls are in place that would protect water quality and reduce the discharge of pollutants to the maximum extent practicable. In addition, each permittee should adopt strategies that incorporate storm water infiltration, reuse and evapotranspiration of storm water into the project to the maximum extent practicable;

Permit Requirements

b. develop and implement strategies which include a combination of structural and/or non-structural BMPs appropriate for all projects within your community for all new development and redevelopment that will reduce the discharge of pollutants, the volume and velocity of storm water flow to the maximum extent practicable. When selecting BMPs to comply with requirements contained in this Part, the permittee should adopt one or more of the following general strategies, in order of preference. Proposal of a strategy should include a rationale for not selecting an approach from among those with a higher preference. When approving a plan for development, redevelopment, highway construction, maintenance, replacement or repair on existing developed sites or other land disturbing activity covered under this Part, the permittee should require the person responsible for that activity to adopt one or more of these strategies, in order of preference, or provide a rationale for selecting a more preferred strategy.

i. preservation of the natural features of development sites, including natural storage and infiltration characteristics;

ii. preservation of existing natural streams, channels, and drainage ways,

iii. minimization of new impervious surfaces;

iv. conveyance of storm water in open vegetated channels;

v. construction of structures that provide both quantity and quality control, with structures serving multiple sites being preferable to those serving individual sites; and

vi. construction of structures that provide only quantity control, with structures serving multiple sites being preferable to those serving individual sites.

Requires a new approach to the site planning and design process…

Better Site Planning

Better Site Design

Small-Scale, Distributed Practices

Stormwater Management Practices

Receiving Waters

First: Reduce Stormwater Runoff By Design

- Better site planning & design techniques
  - Preserve natural areas
  - Conservation design
  - Reduce clearing & grading limits
  - Reduce roadway widths
  - Use alternative cul-de-sacs
  - Promote redevelopment
  - And more…

Second: Reduce Stormwater Runoff Volumes and Pollutant Loads

- Source control practices
  - Storm drain marking
  - Street sweeping
  - Covered fueling areas
  - Spill response plans
  - And more…
- Small-scale, distributed practices
  - Soil restoration
  - Downspout disconnection
  - Rain gardens
  - Bioretention areas
  - Rainwater harvesting
  - Permeable pavement
  - And more…

Third: Capture & Manage Remaining Stormwater Runoff

- Traditional, large-scale practices
  - Stormwater ponds
  - Stormwater wetlands
  - Bioretention areas
  - Infiltration
  - Sand filters
  - Swales

How does it differ from the approach we commonly use?

Development Project

Stormwater Management Practices

Receiving Waters

What is driving our current approach?

- **With our**:
  - Development Rules
  - Stormwater Ordinances
  - Stormwater Management & Site Planning and Design Criteria
- **We encourage**:
  - The creation of excess impervious & disturbed pervious cover
  - A “capture and manage” approach to stormwater management

What are we asking for?

- Development Rules
  - **Typical Rules & Regulations**
  - Wide, closed-section (e.g., curb, gutter, storm drain) roadways
  - Big parking lots, designed based on maximum demand
  - Large building setbacks, creating large lots and lower development densities
  - Wide sidewalks on both sides of the street, even where they're not needed
  - No requirements for tree or buffer conservation
  - Etc.

Rules typically drive the creation of excess impervious and disturbed pervious cover

What are we asking for?

- Stormwater Ordinances
  - **Conventional Criteria**
  - Flood Control
    - 10-year, post- to pre-development
    - 100-year
  - Water Quality
    - Water Quality Volume
      - 90% of storms
      - First flush (0.5” or 1.0” of runoff)

Conventional criteria favor the use of traditional, large-scale stormwater management practices

So, how do we get here?

Better Site Planning

Better Site Design

Low Impact Development Practices

Reduce stormwater runoff volumes…

Stormwater Management Practices

Receiving Waters

Note the significant policy, program and process implications of these changes…

Craft more appropriate criteria

- **Natural Resources Inventory Criteria**
  - Specify that a thorough assessment of the natural resources found on a development site be completed
  - Identification, and subsequent preservation and/or restoration of these natural resources, helps protect them "by design"

"The whole of science is nothing more than a refinement of everyday thinking."
- Albert Einstein (1879-1955), Physicist

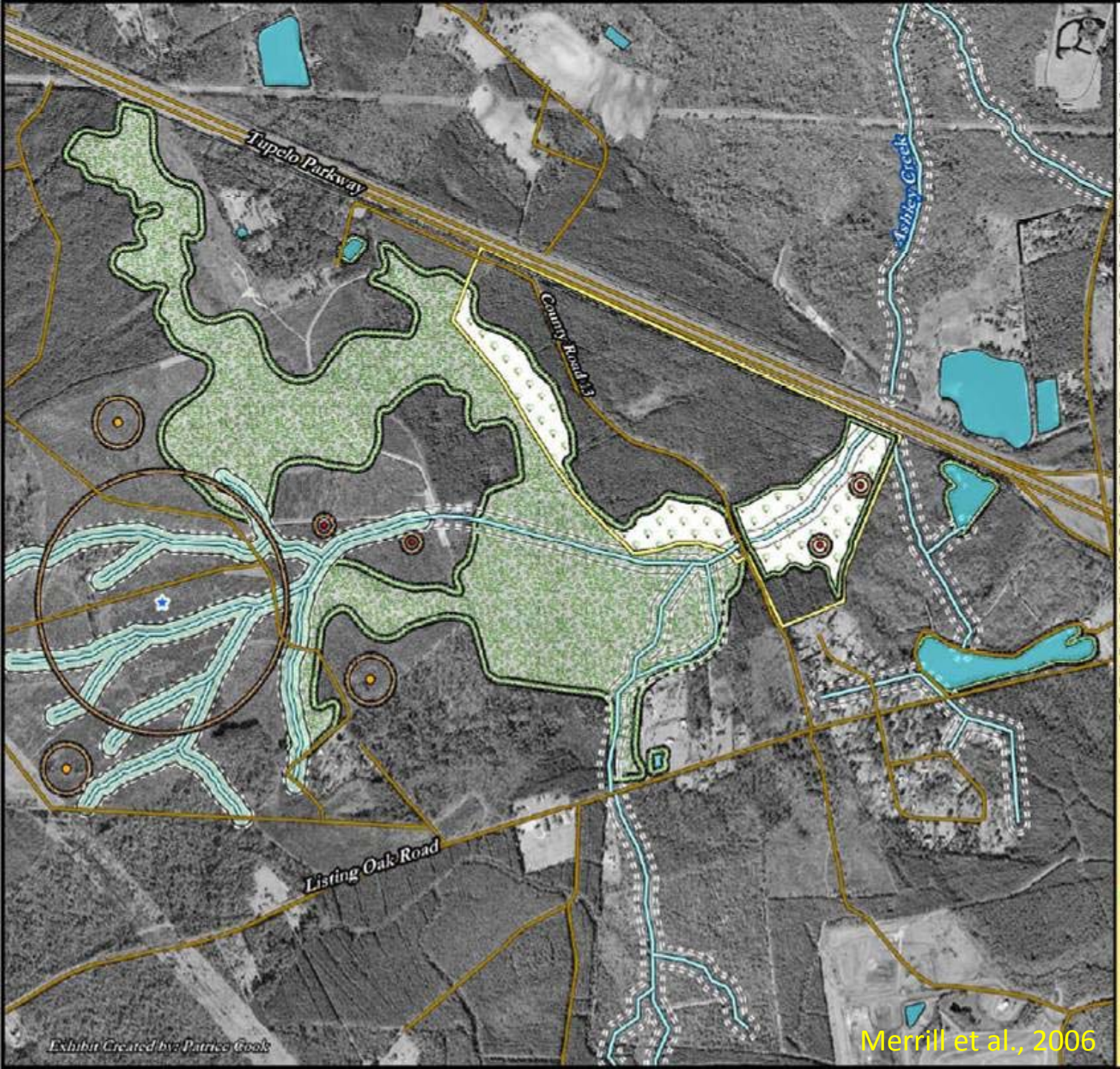


Exhibit 9: Areas of Special Concern with Setbacks and Buffers

Exhibit 9 layers U.S. Fish & Wildlife Service (USFWS) maps of critical habitat and species of concern with federal, state, and county threatened and endangered species lists as well as actual field survey information conducted by the Ashley Creek Wildlife Preserve. This map was used to determine if species of concern and their critical habitats exist on the subject tract. Since the project site is located near a freshwater stream and a large system of bottomlands, essential habitat is available for potential threatened and endangered species. A threatened and endangered species survey was conducted for Ashley Creek Preserve and the immediate areas. GPS was used to locate and map the species and their habitat in the field. This information was then imported to GIS where it was viewed and manipulated to determine the amount of space required to sustain these species once the Tupelo Tract is developed.

Buffers are applied in varying widths to essential habitat including stream and wetlands depending on the habitat requirements of certain species. The state mandates a 50' buffer for streams that support or could support trout and 25' for other streams, lakes, and marshlands. In addition to these buffers, there are species of concern that require buffers of various widths for adequate protection. The Ashley Creek was subject to a 50' buffer due to the presence of protected fish downstream; the Bald Cypress Swamp requires a 25' buffer along its boundaries. In addition, there were several species of concern in the area that require buffers, including a Bald Eagle (1/4 mile), Gopher Tortoise (100'), and Hooded Pitcher Plants (25'). These buffered areas and the resources within them are considered primary and secondary conservation areas. These areas can be beneficial to a development as they form a large continuous green space available for recreational uses such as biking and nature-watching.

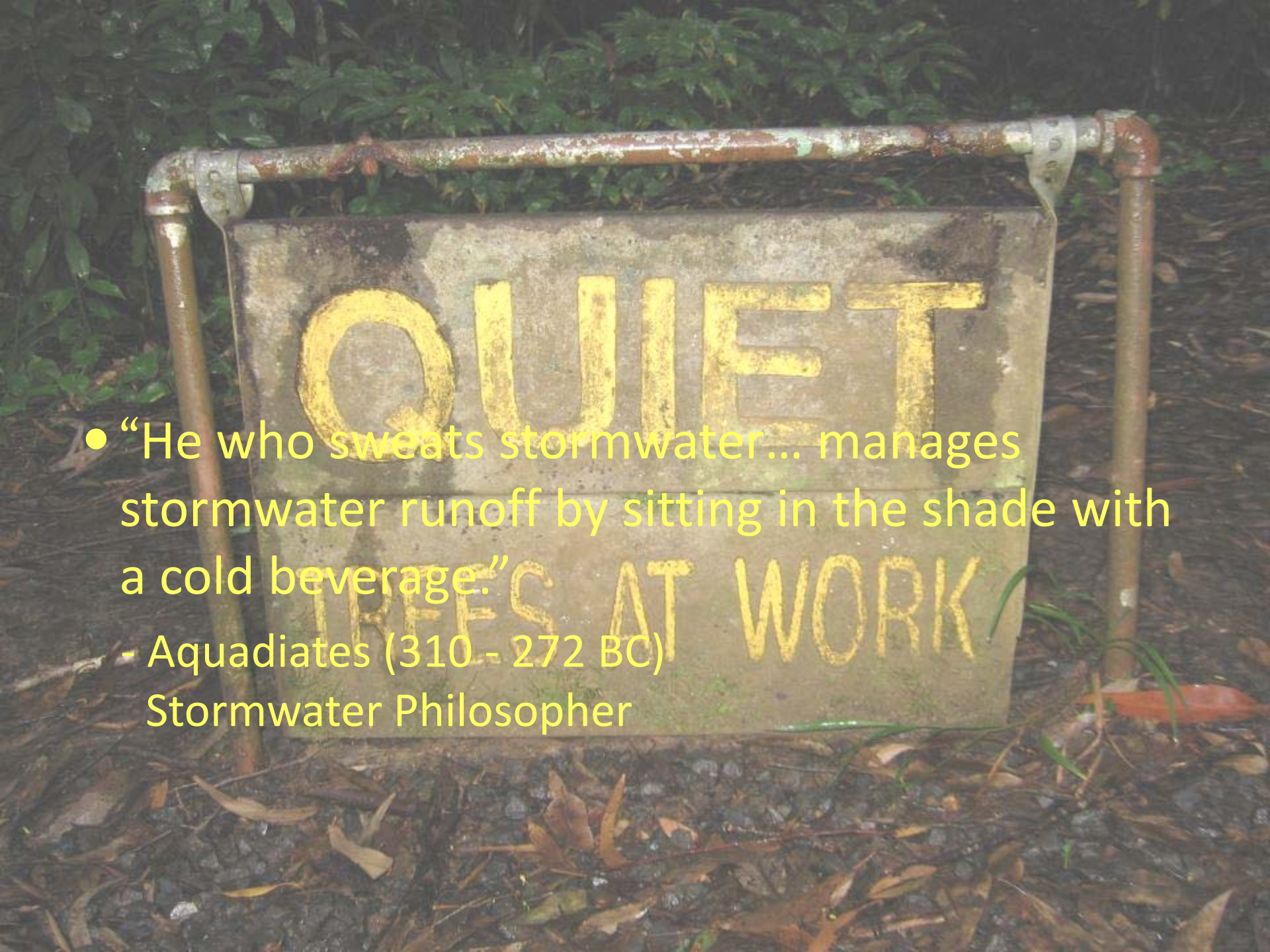
- Hooded Pitcher Plants 25' Buffer
- Gopher Tortoise Burroughs 100' Buffer
- Essential Fish Habitat
- Bald Eagle's Nest 1/4 Mile Buffer
- Buffered Area 64 Acres
- Protected Species Buffers
- Bald Cypress Swamp
- Wetland Buffer 25'
- Tupelo Tract
- Stream Buffer 50'
- Streams
- Lakes
- Roads

1 inch equals 1,000 feet

0 500 1,000 2,000 Feet

N W E S

Merrill et al., 2006



- "He who sweats stormwater… manages stormwater runoff by sitting in the shade with a cold beverage."

  - Aquadiates (310 - 272 BC)
    Stormwater Philosopher

Note the significant policy, program and process implications of these changes…

Craft more appropriate criteria

- **Better Site Design Criteria**
  - Specify that better site design techniques should be used during the creation of a stormwater management concept plan for a proposed development project
  - Minimize the creation of impervious and disturbed pervious cover on development sites

Need to review and revise existing development rules…

How do existing development rules drive impervious and disturbed pervious cover?

Zoning Codes

- Segregated Land Uses
  - Increased vehicle trips
  - Larger, more complex transportation network
  - More parking lots

Subdivision/Building Codes

- Parking Lot Design
  - Parking lot design based on peak demand
  - Larger parking lots
- Lot Size
  - Minimum lot sizes determine development density
  - Larger lot sizes increase road, driveway and sidewalk lengths

How do existing development rules drive impervious and disturbed pervious cover?

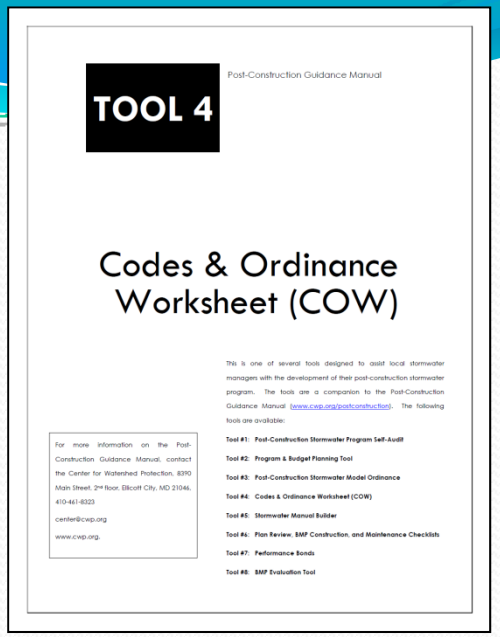
Subdivision/Building Codes (continued)

- Setbacks
  - Setbacks drive neighboring units apart
  - Larger setbacks increase road, driveway and sidewalk lengths
- Building Height
  - Height limitations result in growth moving out, not up
- Loading/Unloading Area Design
  - Often require that all truck maneuvering occur on site
  - Creates additional impervious cover
- Street Design
  - Typical “internal” design reduces connectivity
  - Larger, more complex transportation network

NEW: US EPA Water Quality Scorecard
http://cfpub.epa.gov/npdes/greeninfrastructure/

Code Review

Post-Construction Guide, Tool 4: COW
http://www.cwp.org > Resources > Controlling Runoff & Discharges > Stormwater Management


Post-Construction Guidance Manual

TOOL 4

Codes & Ordinance Worksheet (COW)

This is one of several tools designed to assist local stormwater managers with the development of their post-construction stormwater program. The tools are a companion to the Post-Construction Guidance Manual (www.cwp.org/postconstruction). The following tools are available:

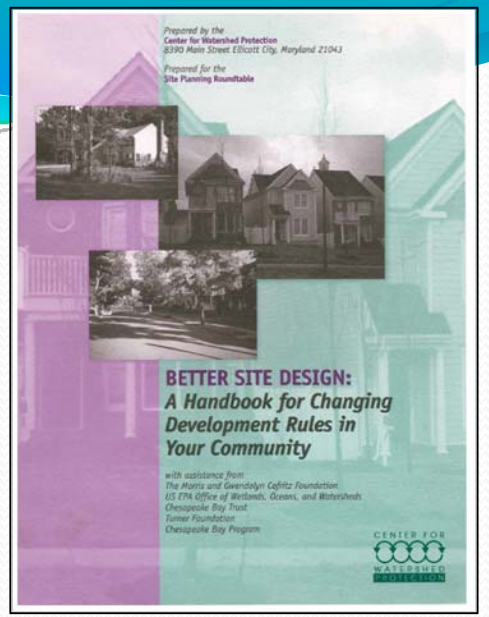
Tool #1: Post-Construction Stormwater Program Self-Audit
Tool #2: Program & Budget Planning Tool
Tool #3: Post-Construction Stormwater Model Ordinance
Tool #4: Codes & Ordinance Worksheet (COW)
Tool #5: Stormwater Manual Builder
Tool #6: Plan Review, BMP Construction, and Maintenance Checklists
Tool #7: Performance Bonds
Tool #8: BMP Evaluation Tool

For more information on the Post-Construction Guidance Manual, contact the Center for Watershed Protection, 8390 Main Street, 2nd floor, Ellicott City, MD 21046, 410-461-8323
center@cwp.org
www.cwp.org

Why?	• Examine local codes (e.g., zoning, subdivision) to identify areas for improvement • Make recommendations for code revisions
How?	• Worksheet • 67 questions • Compare answers to benchmarks • 100 point scoring system

Code Revision

Better Site Design Handbook
http://www.cwp.org > Online Store > Better Site Design



- Use consensus-building roundtable process
- Convene group of "stakeholders" representing development, government, civic and environmental interests and the business community to:
  - Use code review to identify development rules that prevent the use of better site planning and design techniques
  - Develop a set of recommended code revisions

Note the significant policy, program and process implications of these changes…

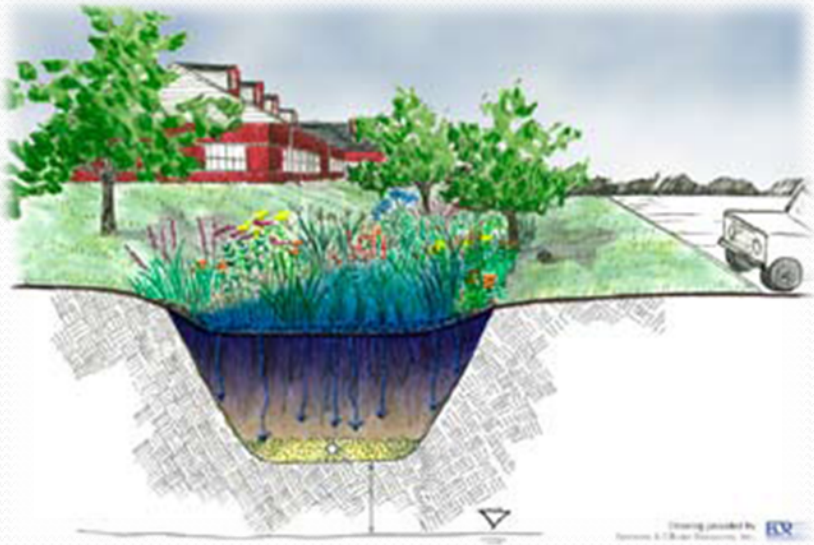
Craft more appropriate criteria

- **Stormwater Runoff Reduction Criteria**
  - Specify a stormwater runoff volume that must be reduced on site, instead of focusing on just runoff rates or a treatment volume
  - Encourages use of <u>all</u> practices that reduce stormwater runoff volumes, either im- or ex-plicitly

"Laws and institutions must go hand in hand with the progress of the human mind."
- Thomas Jefferson (1743-1826)

Stormwater Runoff Reduction

- Hydrology-based
  - Interception
  - Evaporation
  - Transpiration
  - Infiltration
  - Capture and Reuse



Minnesota Stormwater Manual

- Runoff reduction ≠ infiltration
  - When infiltration is difficult, alternative runoff reduction processes can be used

Stormwater BMPs Differ Significantly in Ability to Reduce Runoff Volumes

Stormwater Ponds, Wet Swales, Constructed Wetlands and Filters Reduce Runoff Volumes by 0 to 10%

Bioretention Areas, Infiltration Practices, Dry Swales and Related LID Practices Reduce Runoff Volumes by 50 to 90%

Stormwater BMP Runoff Reduction

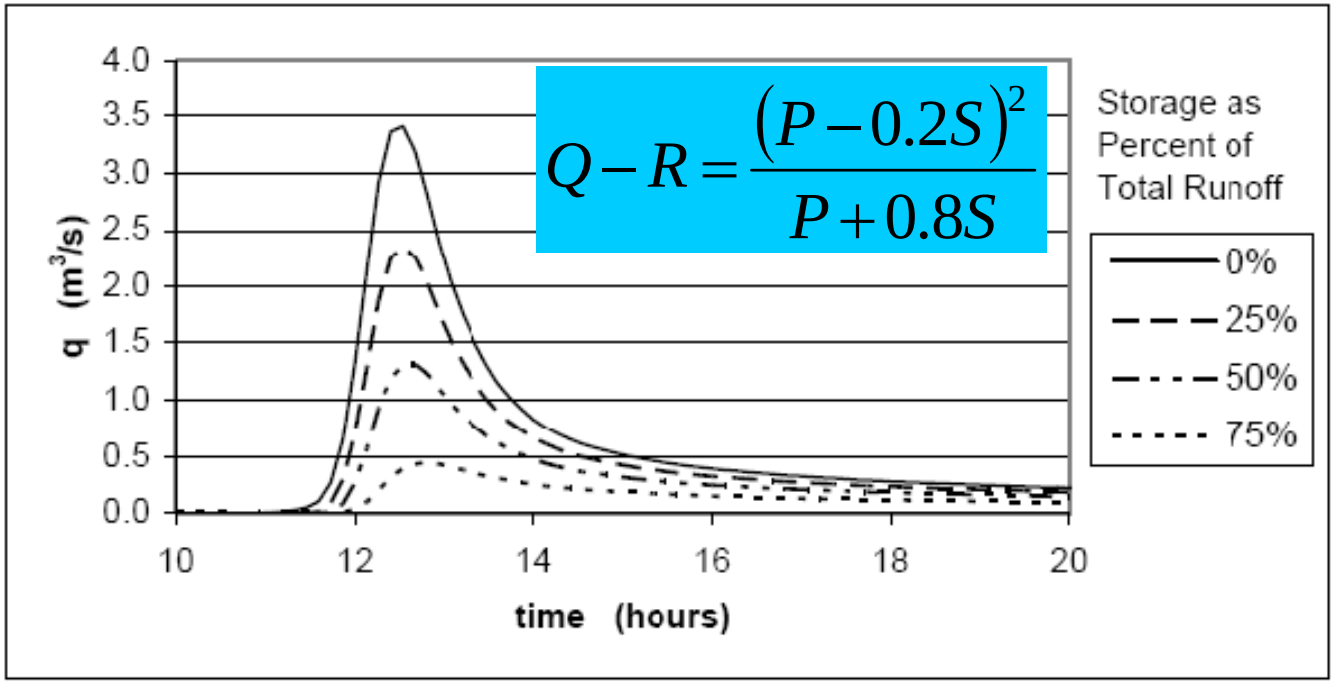
Stormwater Management Practice	Runoff Reduction (%)	TP Removal (%)	Total TP Removal (%)
Green Roof	45 to 60	0	45 to 60
Downspout Disconnection	25 to 50	0	25 to 50
Raintanks and Cisterns	40	0	40
Permeable Pavement	45 to 75	25	59 to 81
Grass Channel	10 to 20	15	23 to 32
Bioretention	40 to 80	25 to 50	55 to 90
Dry Swale	40 to 60	20 to 40	52 to 76
Infiltration	50 to 90	25	63 to 93
Soil Amendments	50 to 75	0	50 to 75
Sheetflow to Open Space	50 to 75		
Filtering Practice	0		
Stormwater Wetland	0		
Wet Pond	0		

http://www.cwp.org > Resources > Controlling Runoff & Discharges > Stormwater Management > Runoff Reduction Technical Memo

Practice	Stormwater Runoff Reduction
Soil Restoration	**"Credit":** Subtract 50% of any *restored areas* from the total site area and re-calculate the runoff reduction volume (RR_v) that applies to a development site.
Site Reforestation/ Revegetation	**"Credit":** Subtract 50% of any *reforested revegetated areas* from the total site area and re-calculate the runoff reduction volume (RR_v) that applies to a development site.
Soil Restoration with Site Reforestation/ Revegetation	**"Credit"** Subtract 100% of any *restored and reforested/ revegetated areas* from the total site area and re-calculate the runoff reduction volume (RR_v) that applies to a development site.
Green Roofs	**"Credit":** Reduce the runoff reduction volume (RR_v) conveyed through a *green roof* by 60%.
Bioretention Areas, No Underdrain	**"Credit":** Subtract 100% of the storage volume provided by a non-underdrained *bioretention area* from the runoff reduction volume (RR_v) conveyed through the *bioretention area*.
Bioretention Areas, Underdrain	**"Credit":** Subtract 50% of the storage volume provided by an underdrained *bioretention area* from the runoff reduction volume (RR_v) conveyed through the *bioretention area*.

Detention Routing: Runoff Hydrograph Modification

Curve Number Adjustment

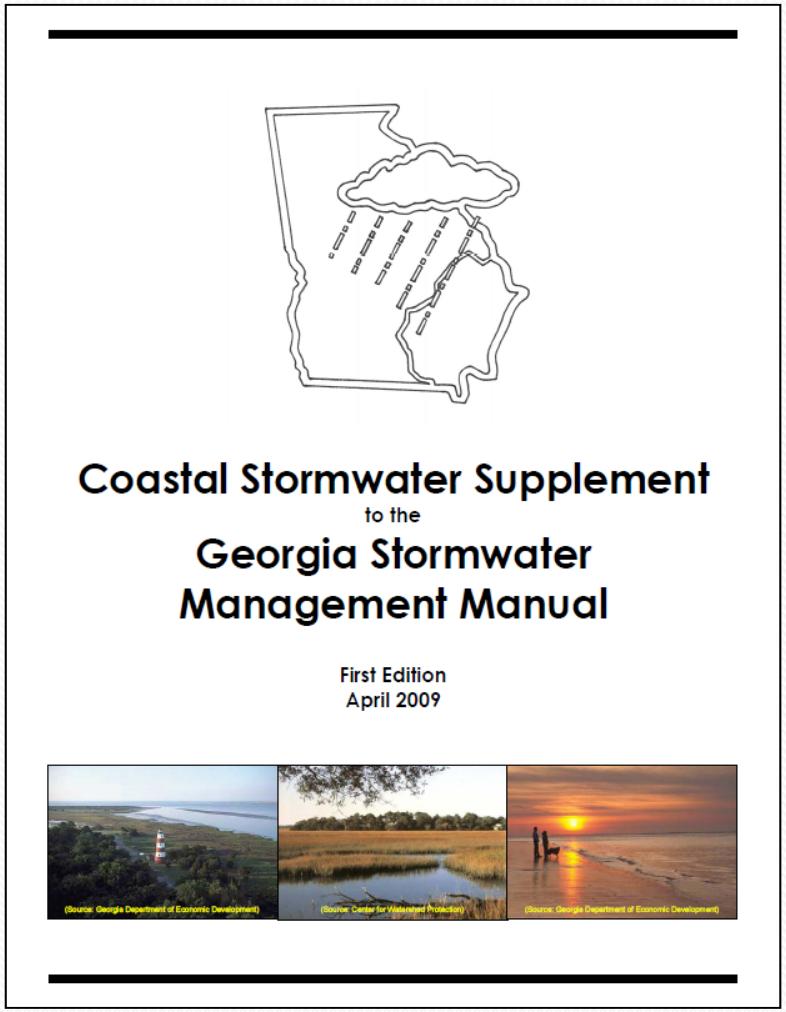


NRCS runoff equation solved for new value of Q, to account for runoff reduction, R. Then a revised CN is calculated using the revised Q. No delay in the Tc is accounted for here. The reduction is distributed across the entire routing, resulting in a conservative estimate of the peak discharge.

State / Community	Criterion	Status
Pennsylvania	The difference in the runoff volume generated by the 2-year, 24-hour storm event from pre-development to post-development conditions must be reduced on site OR Capture at least the first 2 inches of runoff volume from all impervious surfaces within the contributing drainage area; at least the first 1 inch of runoff volume must be reduced on site; at least the first 0.5 inches of runoff volume must be reduced through infiltration	Established
Delaware	Use runoff reduction practices, to the maximum extent practical, to reduce the stormwater runoff volume generated by the 1-year, 24-hour storm event; in Delaware, the 1-year, 24-hour storm event generates 2.5” of rainfall	Proposed
Maryland	The difference in the runoff volume generated by the 1-year, 24-hour storm event from pre-development to post-development conditions must be reduced on site; in Maryland, the 1-year, 24-hour storm event generates between 2.4 and 2.7” of rainfall	Established
Virginia	Use runoff reduction practices to meet nutrient (i.e., phosphorus) load reduction requirements; limit of 0.45 lb P/acre/year for new development projects	Established

State/Community	Criterion	Status
Etowah Watershed, Georgia	The difference in the runoff volume generated by the 2-year, 24-hour storm from pre-development (100% forest cover) to post-development conditions must be reduced on site OR The difference in the runoff volume generated by the 2-year, 24-hour storm from pre-development (95% forest cover and 5% impervious cover) to post-development conditions must be reduced on site Applies to developments within designated priority areas.	Established
Coastal Georgia	To the extent practical, reduce the stormwater runoff volume generated by the 85th percentile storm event (and the “first flush” generated by all larger storm events) through the use of appropriate green infrastructure practices; in Coastal Georgia, the 85th percentile storm event generates 1.2” of rainfall Applies to 24-county coastal region.	Established
Lake County, Cook County, McHenry County, Illinois		Under Development

- Potential resource for local efforts
- Ideas discussed in this presentation, plus:
  - Information about the value of local natural resources
  - Detailed guidance on the site planning & design process, including an accompanying spreadsheet compliance tool
  - Guidance on adapting BMP design to local site characteristics and constraints



http://www.gaepd.org/Documents/CoastalStormwaterSupplement.html

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