Post-Construction Stormwater Management
Satisfying Today's & Tomorrow's Requirements

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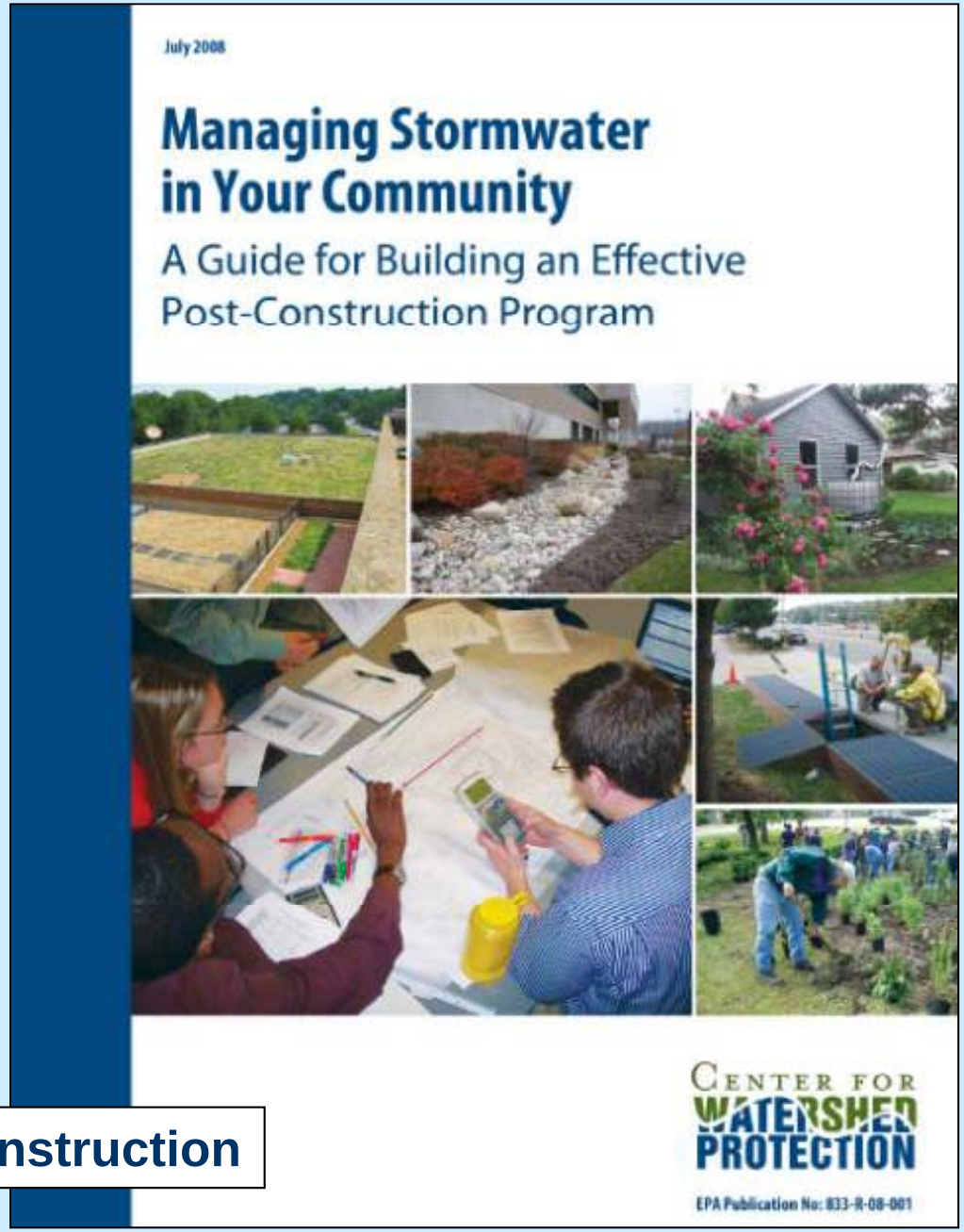
Baxter & Woodman, Inc.

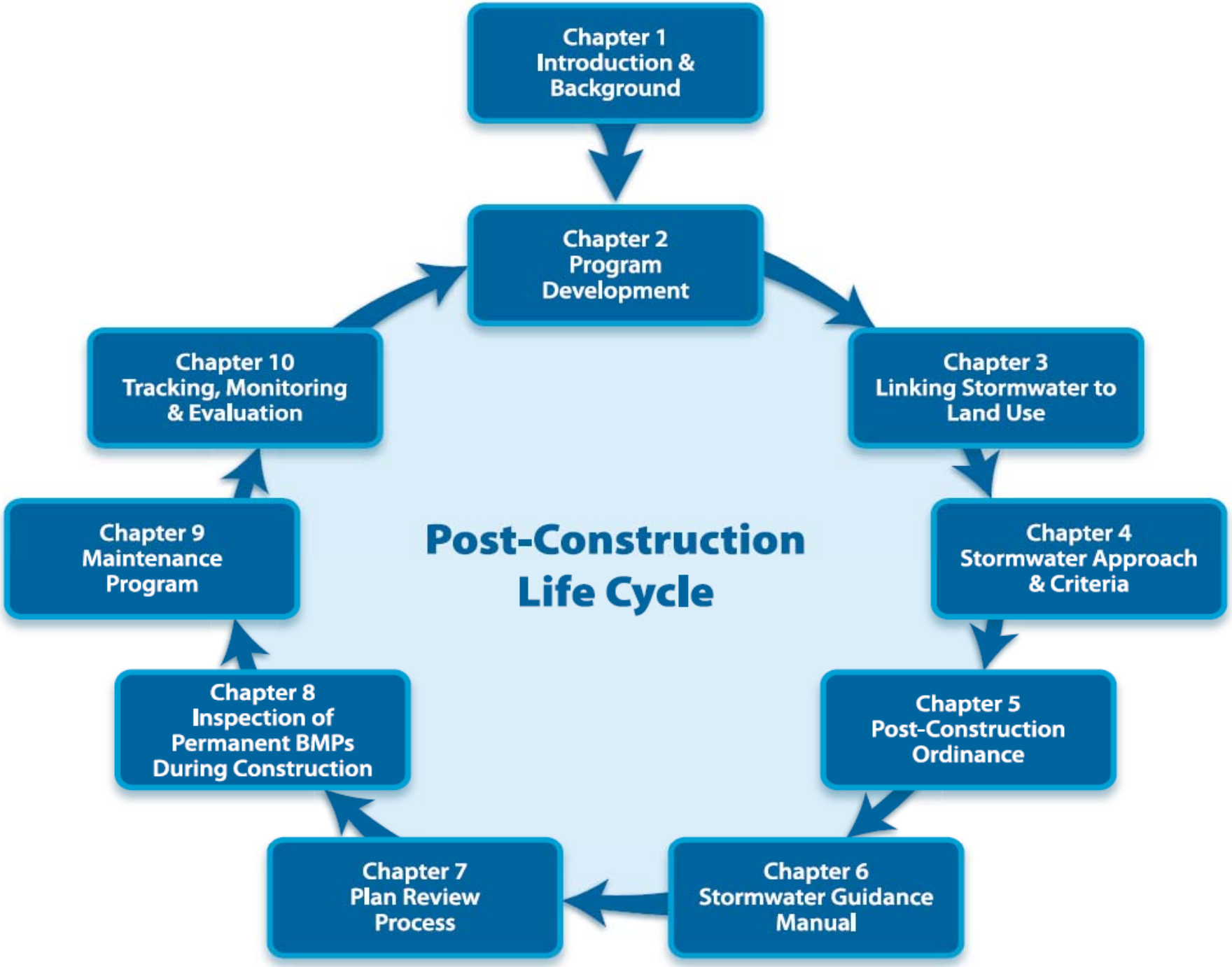
May 25, 2010
Strategies for Compliance with NPDES Stormwater Regulations Workshop
Moline, IL

IAFSM
Illinois Association for Floodplain and Stormwater Management

- Comprehensive Guide for Phase II Communities:
  - Detailed guidance on program setup, creating an ordinance, sizing criteria, planning and growth, low impact development, etc.
  - Includes a variety of tools, including manual builder, model ordinance, performance bond tool, self-audit tool, etc.



http://www.cwp.org/postconstruction


Chapter 1
Introduction &
Background
Chapter 2
Program
Development
Chapter 3
Linking Stormwater to
Land Use
Chapter 4
Stormwater Approach
& Criteria
Chapter 5
Post-Construction
Ordinance
Chapter 6
Stormwater Guidance
Manual
Chapter 7
Plan Review
Process
Chapter 8
Inspection of
Permanent BMPs
During Construction
Chapter 9
Maintenance
Program
Chapter 10
Tracking, Monitoring
& Evaluation
Post-Construction
Life Cycle

Why Stormwater Management?

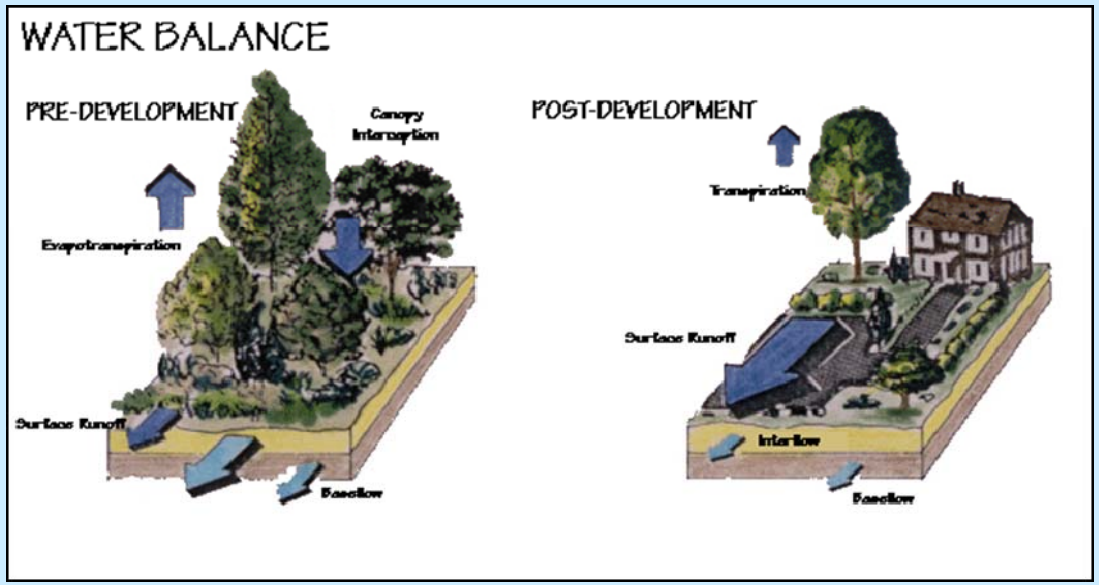
Is Stormwater Runoff Really a Problem?

- "Urban land" is about 3% of the land in the U.S. But "urban runoff" is the source of problems in at least:
  - 22,559 miles or 10% of all Impaired Rivers and Streams
  - 701,024 acres or 7% of all Impaired Lakes
  - 867 square miles or 12% of all Impaired Estuaries

Source: US EPA, 2009. National Water Quality Inventory: Report to Congress, 2004 Reporting Period. Report only describes the quality of assessed waters. Many of the nation's waters remain un-assessed. In the 2004 Reporting Period, only 16% of the nation's rivers and streams, 39% of the lakes, and 29% of the estuaries were assessed.

Effects of Land Development on Stormwater Runoff

- Urbanization/land development changes site hydrology and stormwater runoff characteristics
- These changes can have a number of negative impacts on on-site and downstream terrestrial and aquatic resources

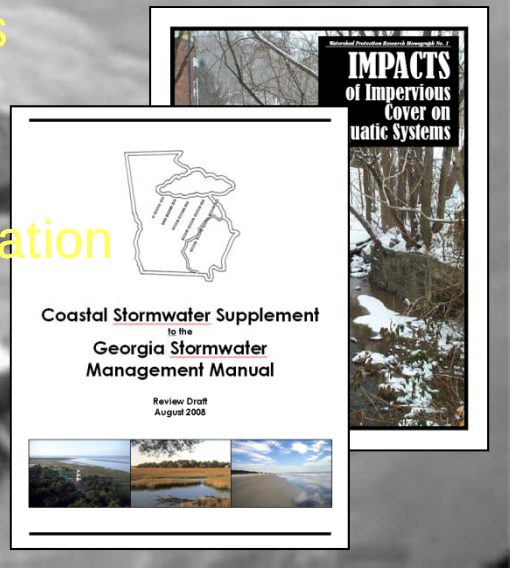


Impacts:

- Hydrologic
- Physical
- Water Quality (Chemical)
- Biological

Stormwater Runoff Causes Real Problems

- Increased flooding
  - Property and infrastructure damage
  - Public health and safety
- Decreased baseflow and groundwater recharge
  - Drinking water supplies
- Reduced water quality
  - Sediment
  - Nutrients
  - Bacteria
  - Temperature
- Degradation of habitat
  - Pool-riffle structure
  - Large woody debris
  - Fish passage
  - Riparian vegetation
- Decline in wildlife abundance and diversity
  - Aquatic insects
  - Fish
  - Shellfish
  - Wetland vegetation

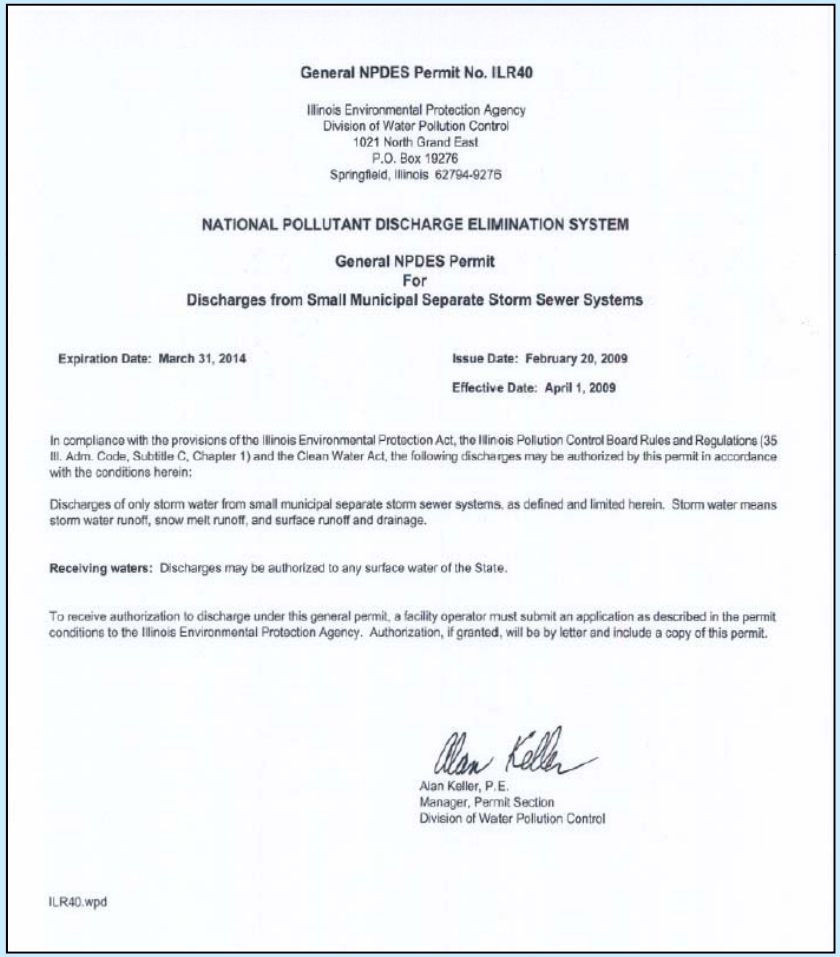


Post-Construction Stormwater Management Programs

- Effective post-construction stormwater management can help prevent these problems
- Not surprisingly, NPDES stormwater regulations tell us to develop local post-construction programs...

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.

Outlines 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

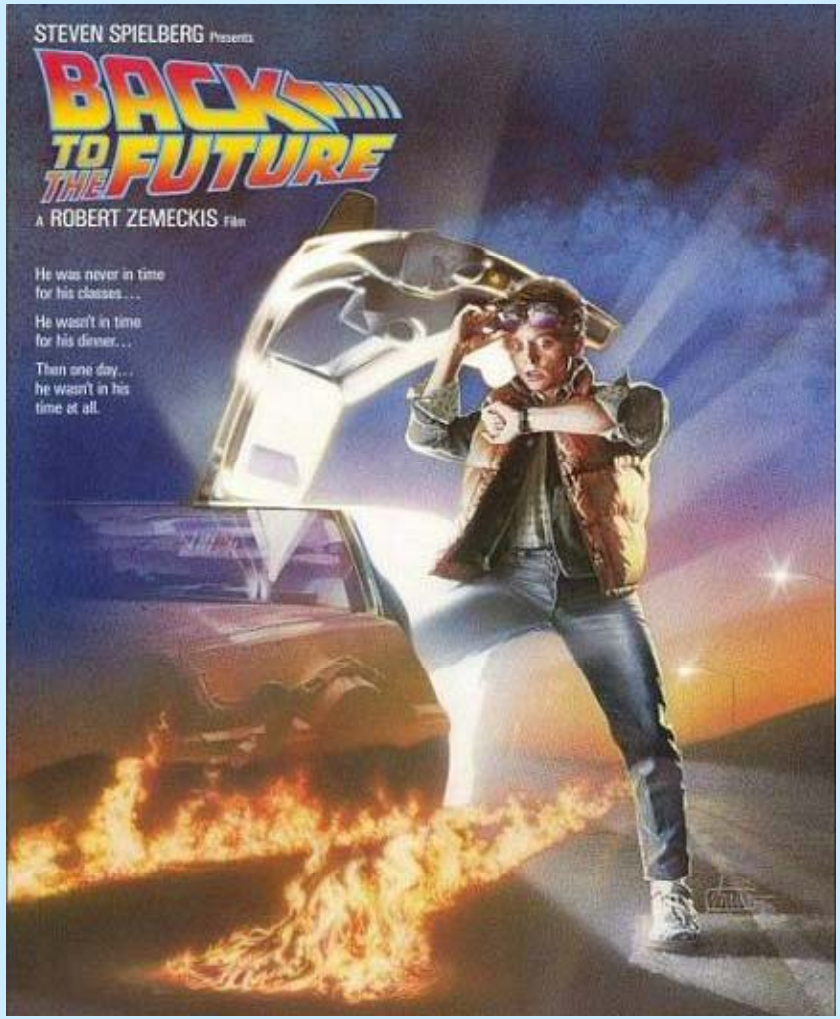
- Source control practices
  - Storm drain marking
  - Street sweeping
  - Covered fueling areas
  - Spill response plans
  - And more...
- Small-scale, distributed practices
  - Soil restoration
  - Downspout disconnection
  - Rain gardens
  - Bioretention areas
  - Rainwater harvesting
  - Permeable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

Third: Capture & Manage Remaining Stormwater Runoff

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

Is this stormwater management approach really “new”?

- Foundation for the approach has been around for thousands of years...



The thatched roof for this building dripped rainwater into the stone carved channel in the foreground

Source: Wright Paleohydrological Institute

During medieval times, vegetated roofs were used in Scandinavia to improve insulation

Source: http://www.roofgreening.ca/section/view?fnode=30

Cistern

Hotel Atlantic View was established in **1928** as Hatteras Island's first hotel. It was built to provide accommodations for wealthy businessmen and industrialists of the era who traveled to the island for its renowned game hunting and sport fishing. **Notice the cistern to the right of the building with the downspouts feeding it rain water from the roof.**

Source: Hatteras Village – Then and Now (http://www.hatteras.biz)

KEY POINT: It does differ from the approach we use now…

Development Project

Stormwater Management Practices

Receiving Waters

What is driving our current approach?

- **With our**:
  - Existing Regulations
  - Stormwater Ordinances
- **We encourage**:
  - "Capture and manage" approach to stormwater management

Urban Stormwater Management in the United States

National Research Council Report

- “Presently, however, the regulation of stormwater is hampered by its association with a statute that focuses primarily on specific pollutants and ignores the volume of discharges”
- “EPA’s current approach is unlikely to...adequately control stormwater’s contribution to waterbody impairment”

http://www.epa.gov/npdes/pubs/nrc_stormwaterreport.pdf

KEY NRC Report Recommendations

- "A straightforward way to regulate stormwater contributions to waterbody impairment would be to use flow or a surrogate, like impervious cover, as a measure of stormwater loading …."
- "Efforts to reduce stormwater flow will automatically achieve reductions in pollutant loading. Moreover, flow is itself responsible for additional erosion and sedimentation that adversely impacts surface water quality."
- "Stormwater control measures that harvest, infiltrate, and evapotranspirate stormwater are critical to reducing the volume and pollutant loading of small storms."

Source: Bob Newport, US EPA Region 5

EPA Initiated Stormwater Rulemaking

- Primary impetus – protect waterbodies from stormwater impact of urbanization
- Oct. 30, 2009 - Federal Register (FR) notice announcing EPA's intent to distribute questionnaires (Information Collection Request (ICR)) seeking data to inform the rulemaking from the following groups:
  - Owners, operators, developers, and contractors of developed sites
  - Owners or operators of MS4s
  - States and territories
- Jan. – Mar. 2010 – Listening Sessions input on preliminary rulemaking considerations (FR Notice published Dec. 28, 2009)
- Spring 2010 – EPA expects to publish a final FR ICR notice with 30-day comment period and distribute questionnaires in the summer
- Late 2011 – EPA expects to propose a rule to be published in the FR for public comment
- Late 2012 – EPA expects to take final action

Source: Bob Newport, US EPA Region 5

KEY QUESTION: How do we get here?

Better Site Planning

Better Site Design

Small-Scale, Distributed Practices

Stormwater Management Practices

Receiving Waters

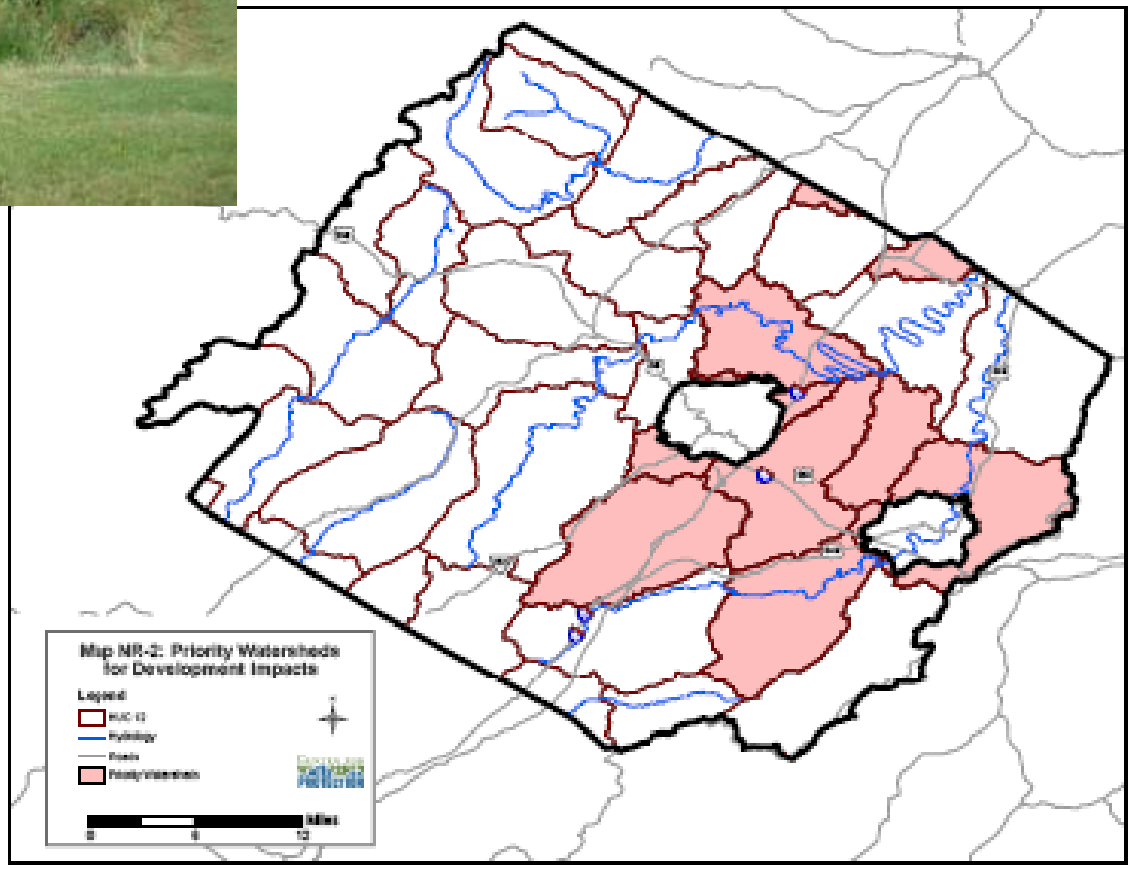

STOP

Are We Focused at the Right Scale?

- Stormwater management hierarchy is applied on a site by site basis
- Need to consider what is happening on a broader scale – neighborhoods, cities, watersheds

Stormwater & Land Use: An Uphill Battle?

Why Should Stormwater Managers Care. . .



. . .What the Comprehensive Plan says?

Land Use As the First BMP!

We Live in Different Worlds

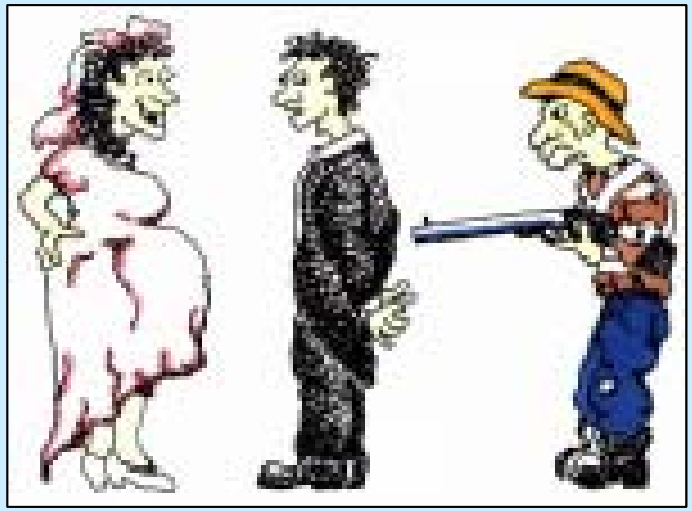
- **Stormwater Manager**
  - Site focus
  - Engineering or PW Department

- **Planner**
  - Community-wide focus
  - Planning/Community Development Department

Different Worlds = No Link

- Responsibilities fractured among different agencies, departments
- If we thinker with local codes, we tend to tinker within individual ordinances
- Stormwater managers as “end line” reviewers

Why should stormwater managers get involved in land use at all?



As noted previously...

- Land use/development has profound impacts on stormwater runoff and watershed health

NPDES MS4 Permit language

- "Use an ordinance or other regulatory mechanism to address post-construction runoff..."
- Local codes already contain numerous stormwater-related requirements...

Comprehensive Plan & Stormwater Program Should Send the Same Message

Development Should Be Directed Toward Some Areas. . .

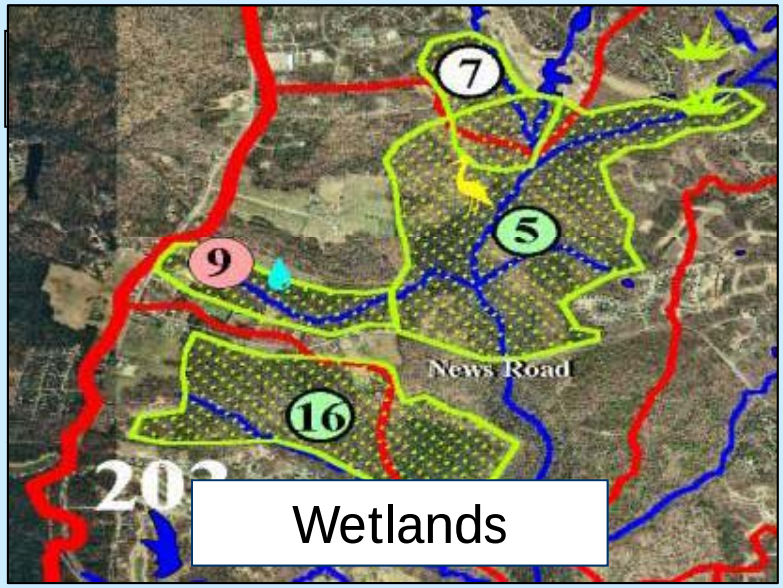

Transit Hubs


Underutilized Commercial


Redevelopment Sites


Infrastructure Corridors

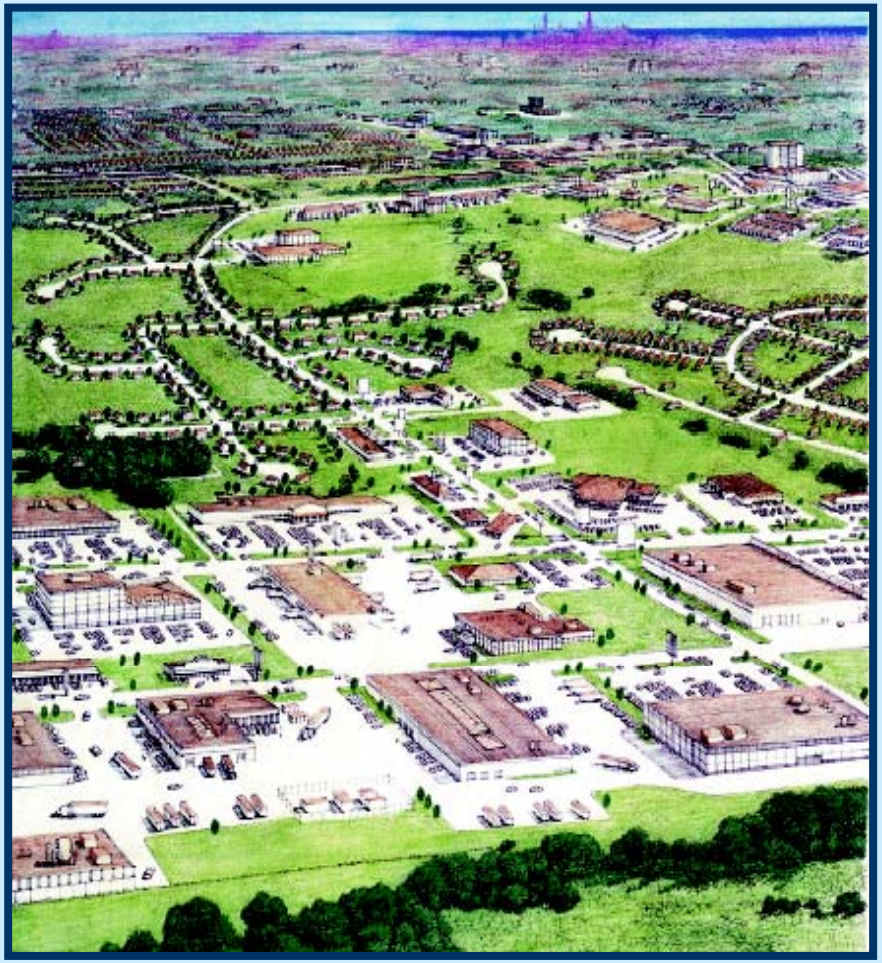
. . .And Away From Others

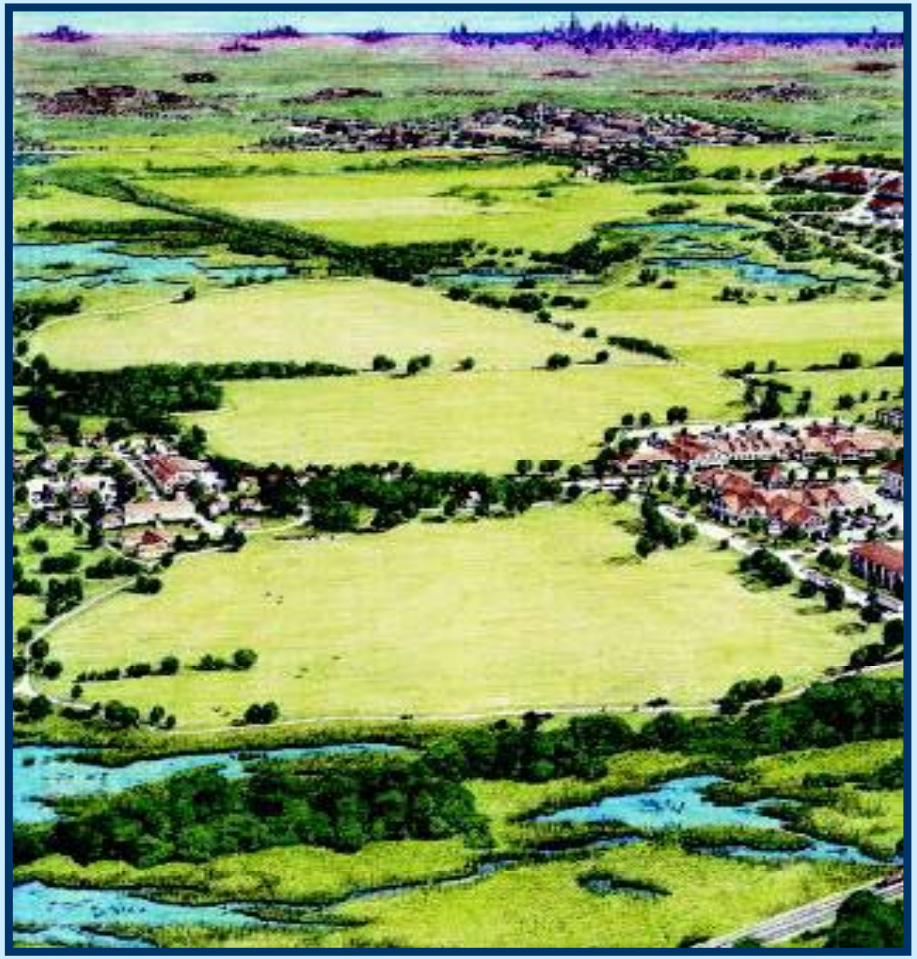


Land Use Planning Strategies

- Encouraging Development Where We **DO** Want It:
  - Infrastructure Planning
  - Infill and Redevelopment Incentives
  - Flexible Development and Stormwater Management Criteria
  - Fee-In-Lieu Programs
  - Etc.
- Discouraging Development Where We **DON'T** Want It:
  - Overlay Zoning
  - Special Development and Stormwater Management Criteria
  - Conservation Easements
  - Infrastructure Restrictions
  - Etc.

Remove Drivers of Excess Impervious Cover and Land Disturbance from Local Codes





How do local codes drive the creation of impervious cover?

Zoning Ordinances

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

Subdivision / Building Ordinances

- 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

More Impervious Cover = More Stormwater Runoff

How do local codes drive the creation of impervious cover?

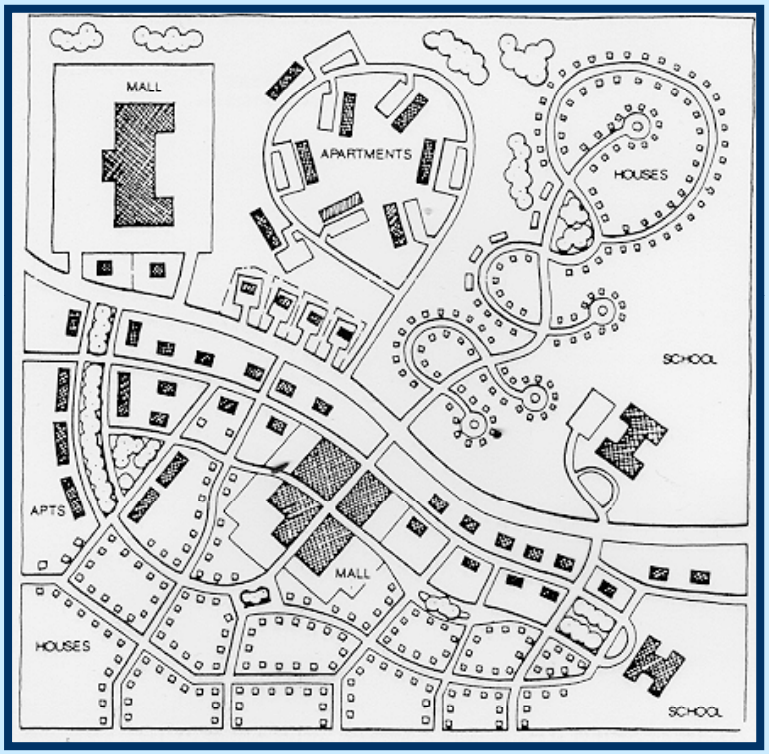
Subdivision / Building Ordinances (Continued)

- 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

More Impervious Cover = More Stormwater Runoff

Rethinking Street Design

- Work with road builders, emergency responders on alternative designs
- “Designing Walkable Urban Thoroughfares”
  - Institute for Transportation Engineers (ITE), 2010
  - Produced with US EPA, FHWA and the Congress for New Urbanism
  - Context sensitive solutions; example of offering alternative to standard “cookie cutter” code
  - Add options to the designer’s toolbox



Rethinking Parking

- Most codes cap the building footprint (e.g., 30% of site)
  - Few cap parking lot size
- Won't green parking solve everything?
  - Cutting down trees to install permeable pavement still a net negative for the watershed

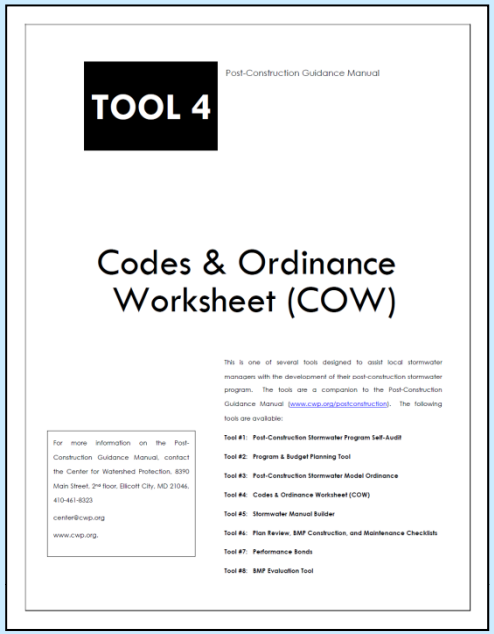
Rethinking Parking

- No “magic wand” to reduce parking lot size; integrated solutions
- Parking Generation
  - ITE, 2004
  - 4th Edition under development
- Demand management
  - Charging for parking
  - Priority spaces for carpools
- Shared parking
  - Agreements
  - Structured parking
- Creative provisions for overflow parking

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:

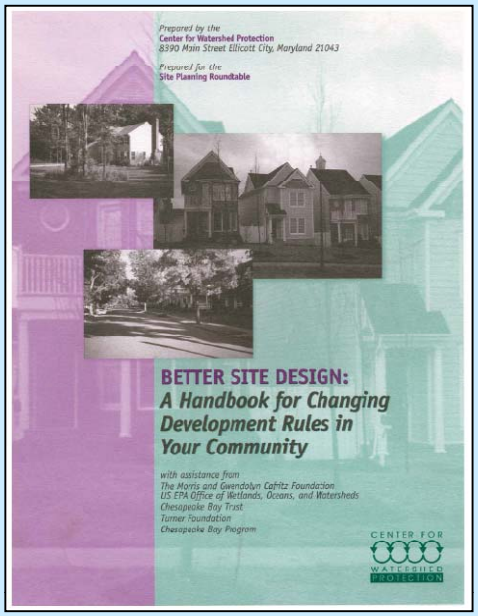
Tool #1: Post-Construction Stormwater Program Self-Audit
Tool #2: Program & Budget Planning Tool
Tool #3: Post-Construction Stormwater Model Ordinance
Tool #4: Codes & Ordinance Worksheet (COW)
Tool #5: Stormwater Manual Builder
Tool #6: Plan Review, BMP Construction, and Maintenance Checklists
Tool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

At the Site Scale…

- Once we reach the site level, need to ensure that stormwater management is done “right” during site design
- We do this with:
  - Stormwater Ordinances
  - **Stormwater Management Criteria**

Conventional Stormwater Management Criteria

What are we currently asking for?

- Flood Control
  - 10-year, post- to pre-development
  - Etc.
- Water Quality
  - Water Quality Volume
    - 90% of storms
    - First flush (0.5” or 1.0” of runoff)
- Channel Protection
  - Extended detention of 1-year, 24-hour storm

What stormwater management practices can be used to meet these conventional criteria?


THIS COMPLIES!

SO DO THESE!

Ponds are prevalent because they can be designed with capacity to meet existing stormwater criteria

DOES THIS COMPLY?


HOW ABOUT THIS?

WHAT ABOUT THESE?

Source: http://www.greenroofs.com

Green infrastructure practices must be authorized or given credit by the local program if they are to be used

How do we make use of green infrastructure and still verify compliance?

- Step 1: Review & Supplement Existing Criteria
- Step 2: Develop Stormwater “Credit” System

Post-Construction Guide: Chapter 6, Section 6.10
http://www.cwp.org > Resources > Controlling Runoff & Discharges > Stormwater Management

Step 1: Review & Supplement Existing Criteria

Conventional:

- Flood Control
- Channel Protection
- **Water Quality**

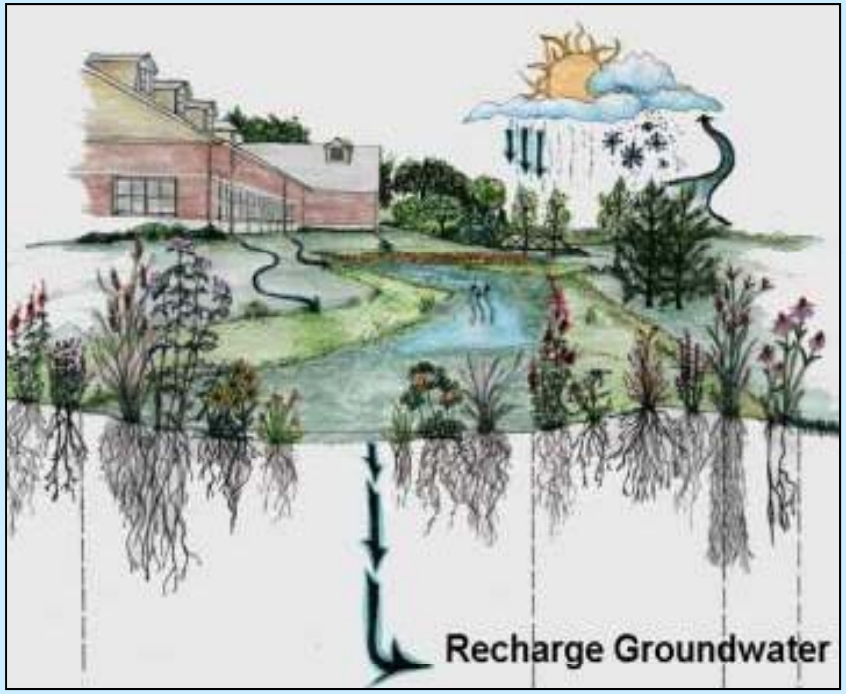
If Possible:

- Natural Resources Inventory
  - Require that natural resources be identified and mapped prior to the start of land development
- **Runoff Reduction**
  - Specify a stormwater runoff volume that must be retained, reused or otherwise reduced (instead of just captured and managed) on site

Provide Framework for Stormwater "Credit" System…

Runoff Reduction

- Runoff reduction is the total runoff volume reduced through the processes of interception, infiltration, evaporation, transpiration, rainwater harvesting and extended filtration at development sites



Groundwater recharge, water quality and even channel protection criteria can be collapsed into a single runoff reduction criterion that helps maintain pre-development site hydrology

Stormwater BMP Runoff Reduction

Stormwater Management Practice	Runoff Reduction (%)	TP Removal (%)	Total TP Removal (%)
Green Roof	*45 to 60*	*0*	*45 to 60*
Rooftop 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

Benefits of Runoff Reduction

- Helps maintain pre-development hydrologic conditions (e.g., runoff rates and volumes, groundwater recharge)
- Enhances reliability of pollutant load (mass) reductions
- Provides **common basis** for measuring the performance of better site design, green infrastructure and stormwater management practices
- Encourages the conservation of natural resources and the use of wide variety of BMPs

Runoff Reduction Practices

Better Site Planning*	Better Site Design*	Small-Scale Distributed
• Preserve Undisturbed Natural Areas • Preserve Riparian Buffers • Preserve Floodplains • Preserve Natural Drainage Features • Preserve Porous and Erodible Soils • Preserve Steep Slopes • Preserve Valuable Habitat Areas	• Reduce Clearing and Grading Limits • Reduce Roadway Lengths and Widths • Reduce Sidewalk Lengths and Widths • Use Fewer or Alternative Cul-de-Sacs • Reduce Parking Lot Footprints • Reduce Building Footprints • Reduce Setbacks and Frontages	• Soil Restoration* • Site Reforestation* • Undisturbed Natural Areas • Vegetated Filter Strips • Grass Channels • Simple Disconnection • Rain Gardens • Stormwater Planters • Dry Wells • Rainwater Harvesting • Green Roofs • Permeable Pavement • Bioretention • Infiltration • Dry Swales • Extended Detention

*** Practices typically considered to be "self-crediting"**

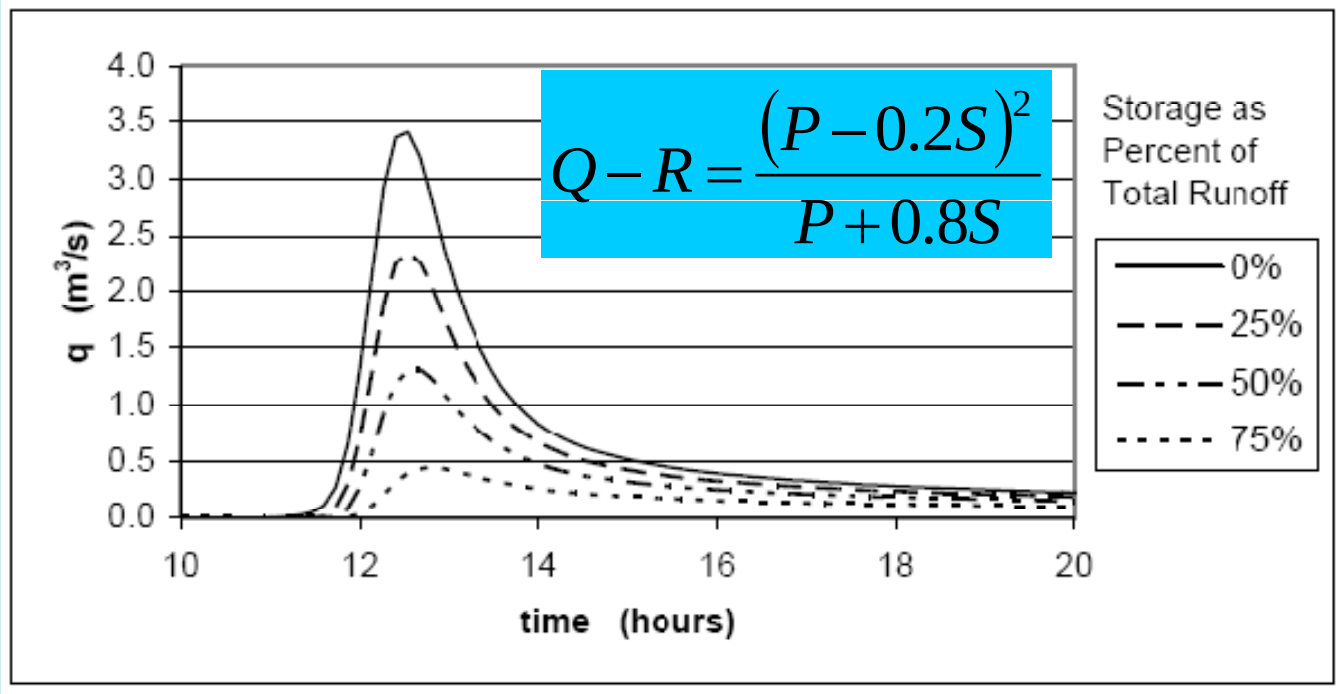
Step 2: Develop a Stormwater "Credit" (Compliance) System

- Give "credit" for conserving hydrologically significant natural areas, reducing site impervious cover and reducing stormwater runoff:
  - Simple point system (site design exercise)
  - Adjust water quality volume (WQ_v)
  - Reduce runoff reduction volume (RR_v)
  - Reduce storage volume required for larger storms (CP_v, Q_{10}, Q_{100}) by:
    - Adjusting Curve Number (CN) or
    - Decreasing Time of Concentration (T_c)

Practice	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.

Example Stormwater "Credit" (Compliance) Systems

- Adjust water quality volume (WQ_v):
  - Georgia Stormwater Management Manual
  - Vermont Stormwater Management Manual
  - Minnesota Stormwater Manual
- Reduce runoff reduction volume (RR_v):
  - Maryland Stormwater Management Regulations
  - Virginia Stormwater Management Regulations
  - Georgia Coastal Stormwater Supplement

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	Under Development
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
Federal Development Projects	The sponsor of any development or redevelopment project involving a Federal facility with a footprint greater than 5,000 SF shall use site planning, design, construction and maintenance strategies to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with	Established

Contact Information

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