Leveling the Playing Field for Innovation

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Low Impact Development Summit
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Beaufort, SC

CENTER FOR WATERSHED PROTECTION

Source: Randall Arendt

About the Center for Watershed Protection

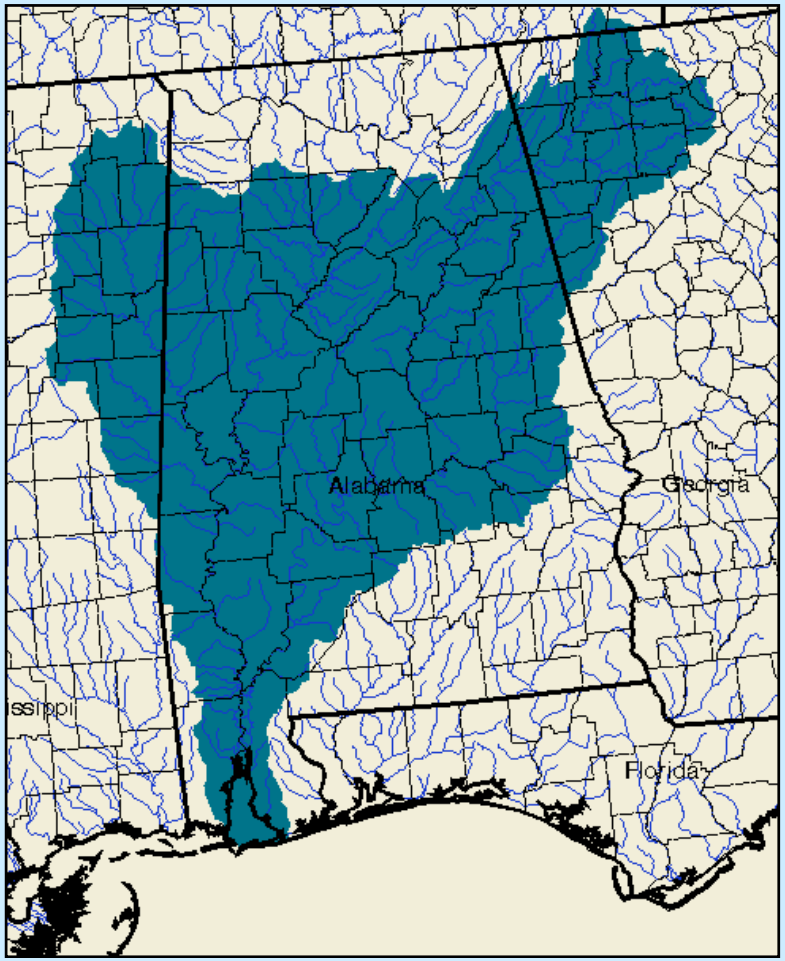
- Non-profit 501(c)3, non-advocacy organization
- Work with watershed groups and local, state and federal governments
- Provide tools communities need to manage watersheds and protect streams, lakes and rivers
- 18 staff in Ellicott City, MD
- 2 websites:

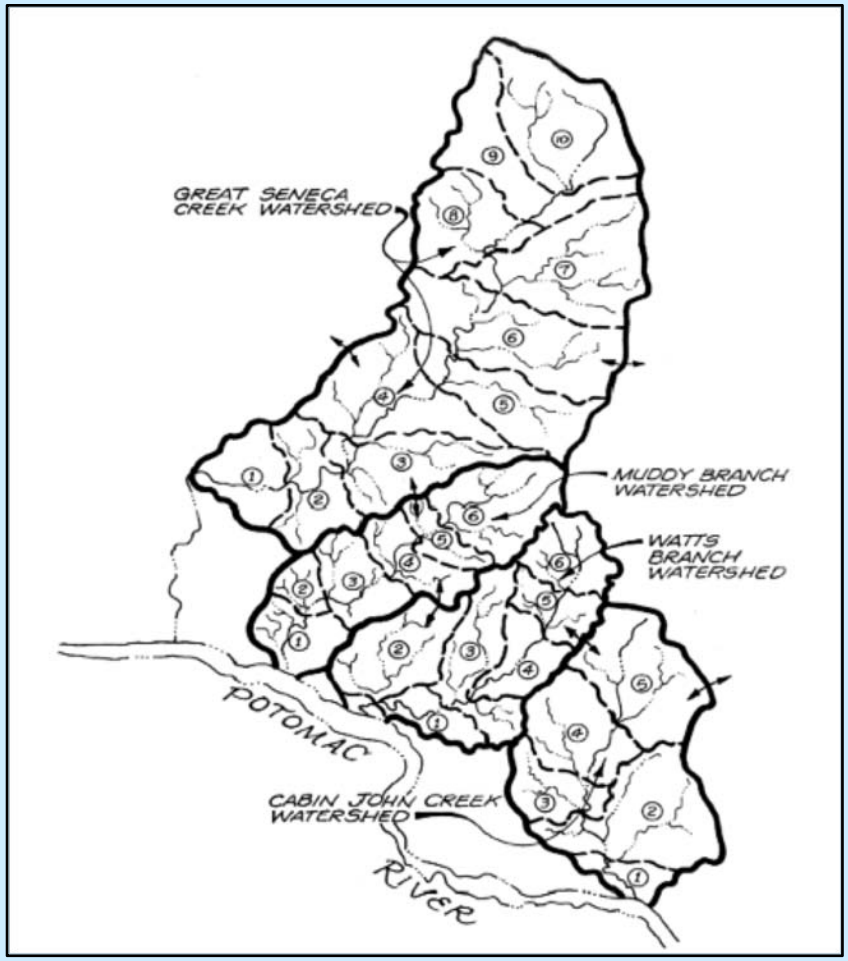
  www.cwp.org

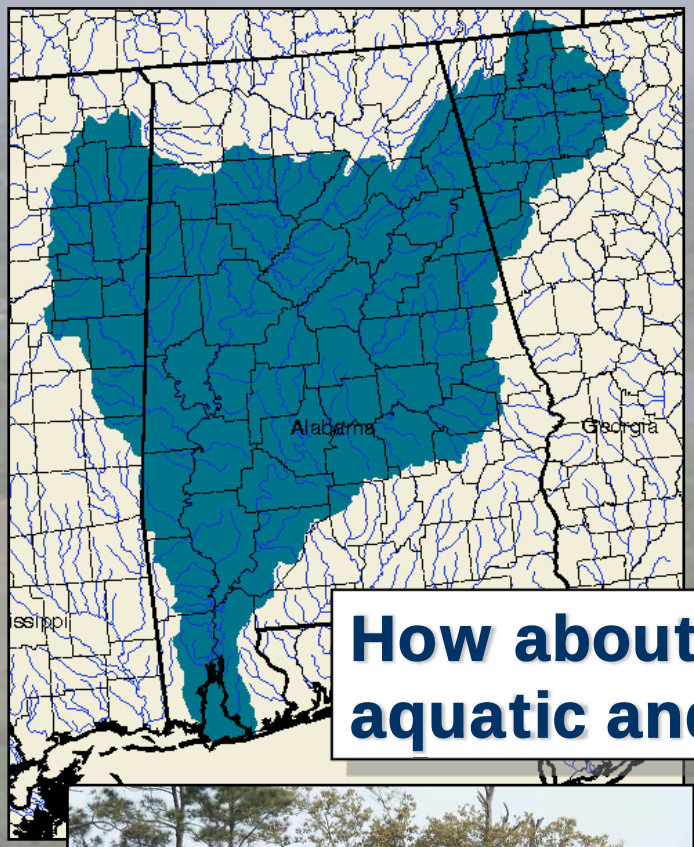
  www.stormwatercenter.net

CENTER FOR WATERSHED PROTECTION

What is a watershed?





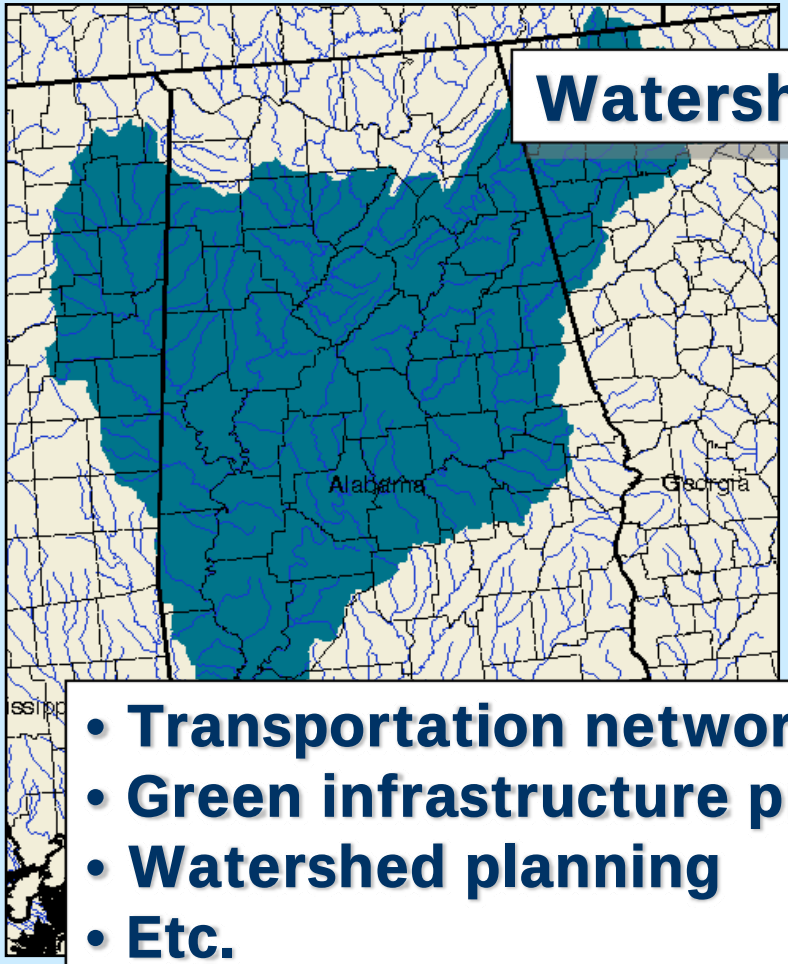


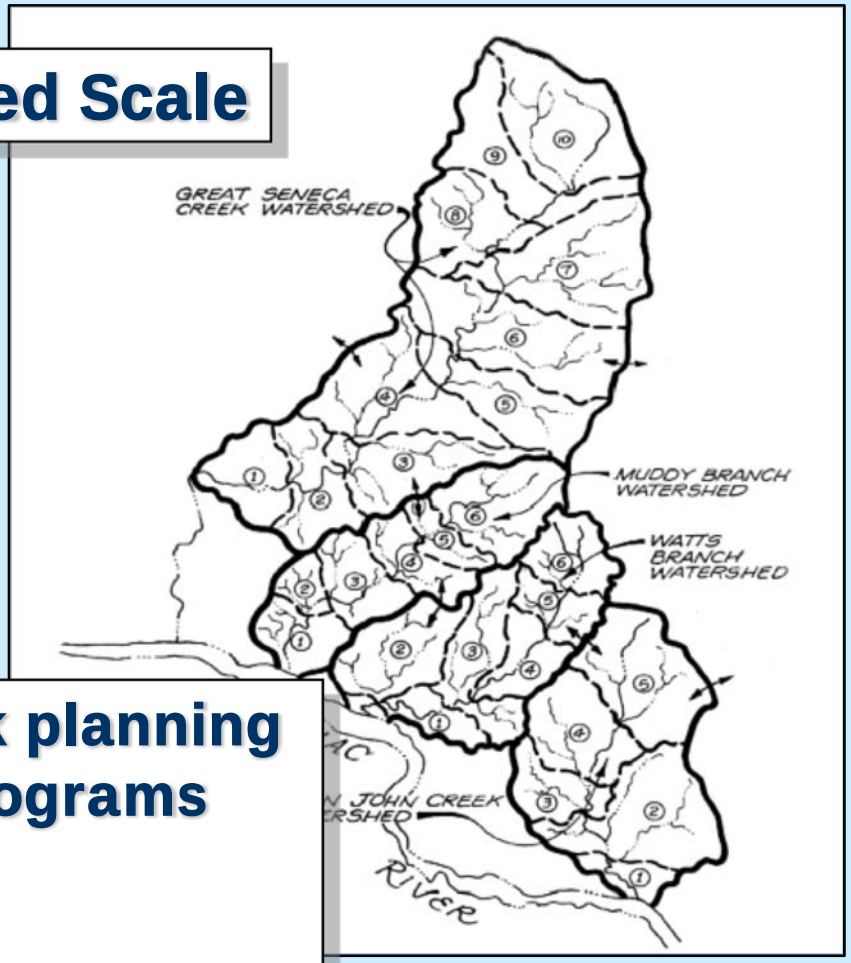
How about an interconnected network of aquatic and terrestrial resources?

Source: Harford County, MD DPW

As we begin planning for sustainability, it is important that we assess each of the different scales at which we can work to protect and restore natural resources…

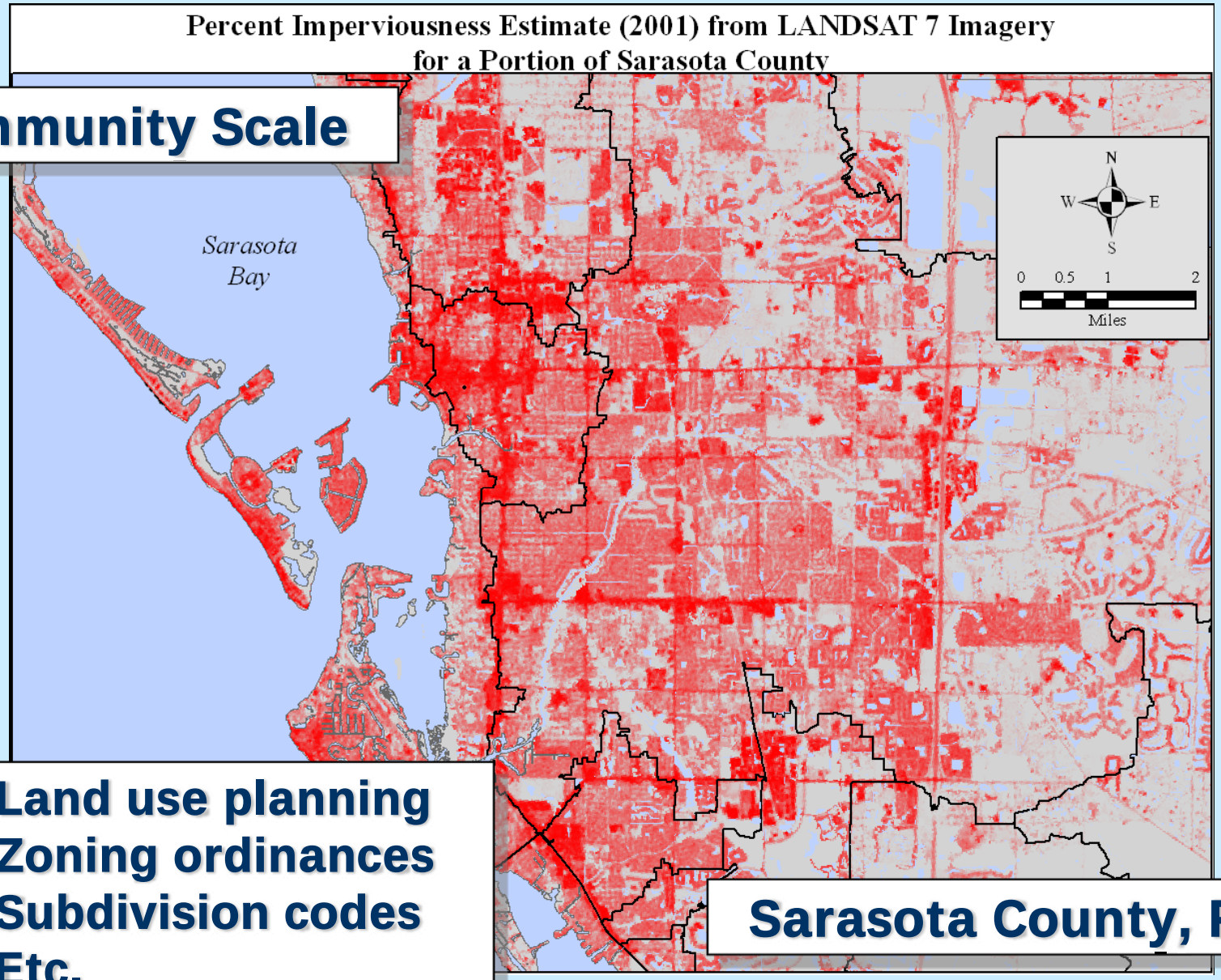
Watershed Scale





- Transportation network planning
- Green infrastructure programs
- Watershed planning
- Etc.

Community Scale

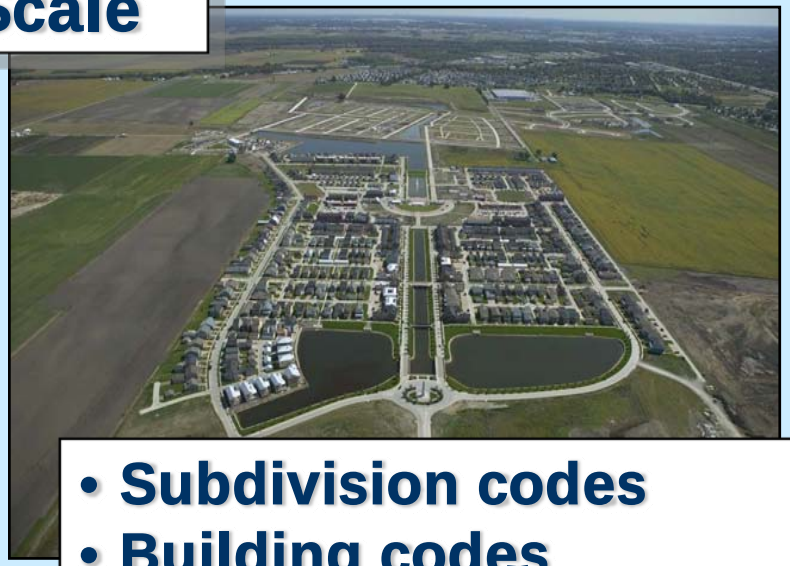


- Land use planning
- Zoning ordinances
- Subdivision codes
- Etc.

Sarasota County, FL

Site Scale

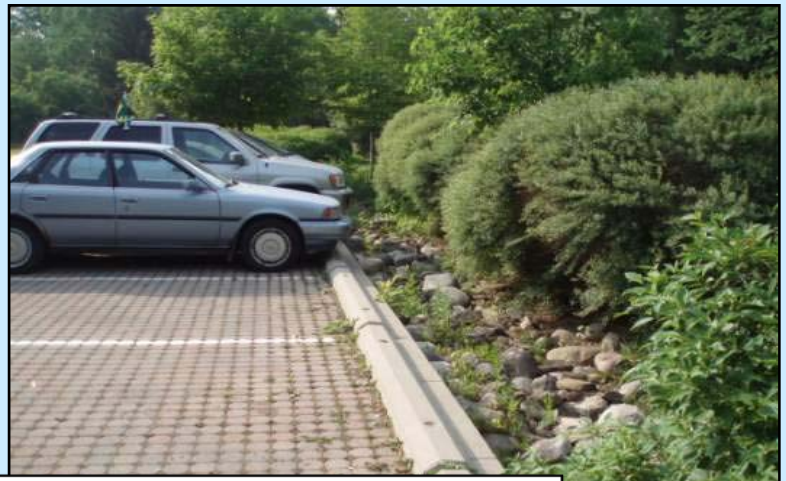
Source: Harford County, MD DPW



- Subdivision codes
- Building codes
- Stormwater ordinances
- Etc.

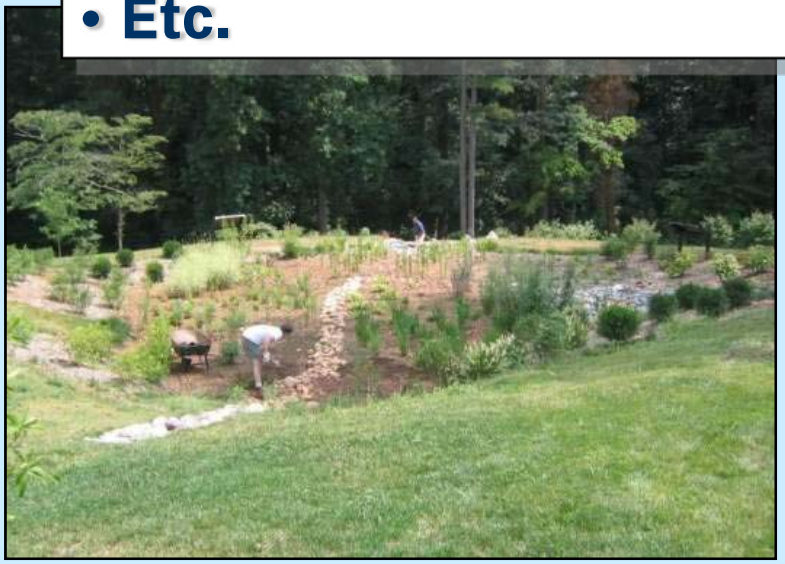
Source: Planning with Power, Purdue University

Source: Harford County, MD DPW



Catchment Scale

- Stormwater ordinances
- Stormwater manuals
- Etc.

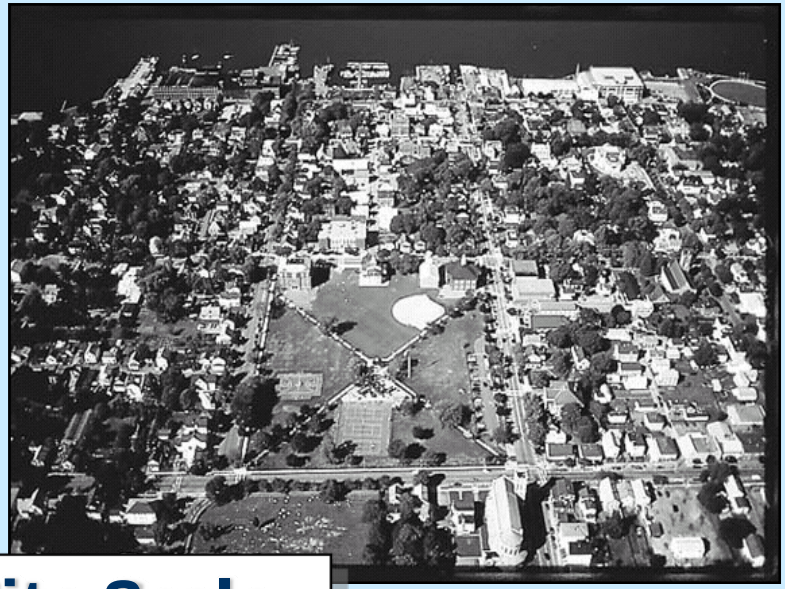


Importance of Scale

- Watershed Scale
- Community Scale
- Site Scale
- Catchment Scale

As we improve our approach to watershed management, we've got to make sure that we're sending the same message at each scale!

If we want this…



Site Scale

and this…

Catchment Scale

Why do we always get this?

Site Scale

and this?

Catchment Scale

The fact is, we ask for it!

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

What are we asking for?

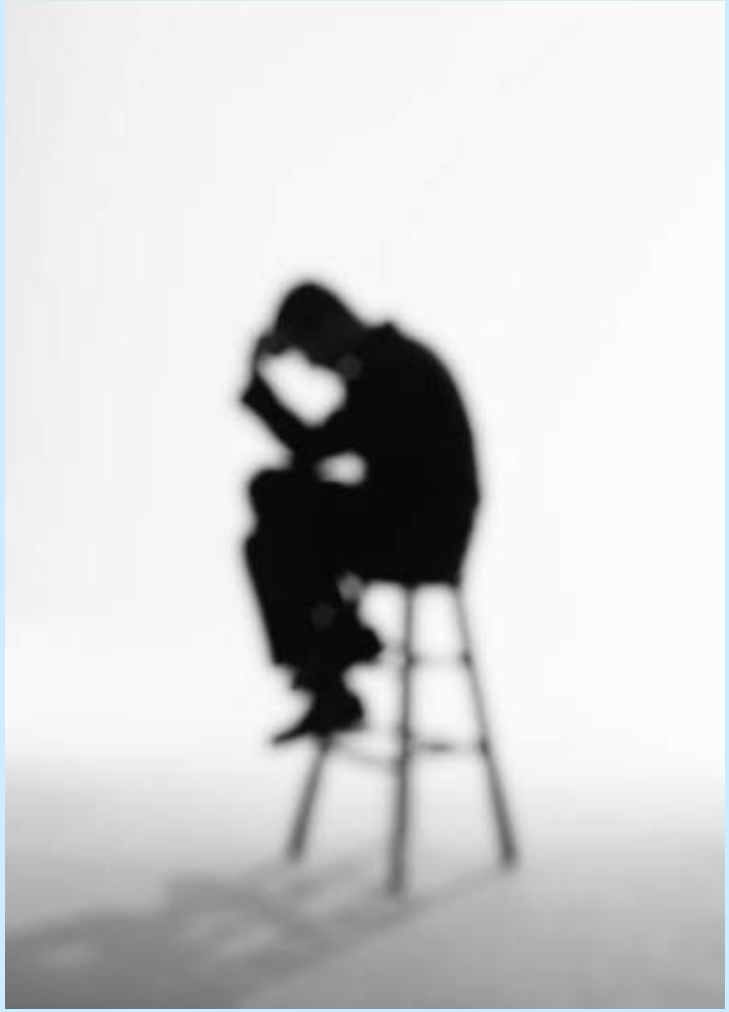
- Development Rules & Regulations
  - **Typical Rules & Regulations**
  - Wide, closed-section (e.g., curb and gutter) roadways
  - Big parking lots, designed based on maximum demand
  - Large building setbacks, creating large lots and lower development densities
  - Wide sidewalks on both sides of the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

All of these drive the creation of excess impervious and disturbed pervious cover

What are we asking for?

- Stormwater Codes & 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)
  - Channel Protection
    - Extended Detention of 1-year, 24-hour storm

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



THIS COMPLIES!

SO DOES THIS!

COMPLIANCE ACHIEVED!

A Destination?

CAN:

- Flood Control
- Channel Protection
- Water Quality (?)
- Safety / Nuisance Concern
- High Maintenance Burden

CAN'T:

- Groundwater Recharge
- Runoff Reduction
- Wildlife Habitat
- Conserve Resources

DOES THIS COMPLY?

HOW ABOUT THIS?

WHAT ABOUT THESE?

Source: http://www.greenroofs.com

DOES THIS?

Maybe this is our destination?

CAN:

- Flood Control
- Channel Protection
- Water Quality
- Groundwater Recharge
- Runoff Reduction
- Wildlife Habitat
- Conserve Resources
- Low Maintenance Burden

With our existing codes, we encourage this…

Development Project

Stormwater Management Practices

Receiving Waters

Here is our "capture and treat" approach to stormwater management…

So how do we get something that looks more like this?

Better Site Planning

Better Site Design

Low Impact Development Practices

Stormwater Management Practices

Receiving Waters

Revise what we are asking for!

- Natural Resources Inventory Criteria
  - Specify that a thorough assessment of the natural resources found on a development site be completed prior to the start of any land disturbing activities
  - 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 Eistein (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.

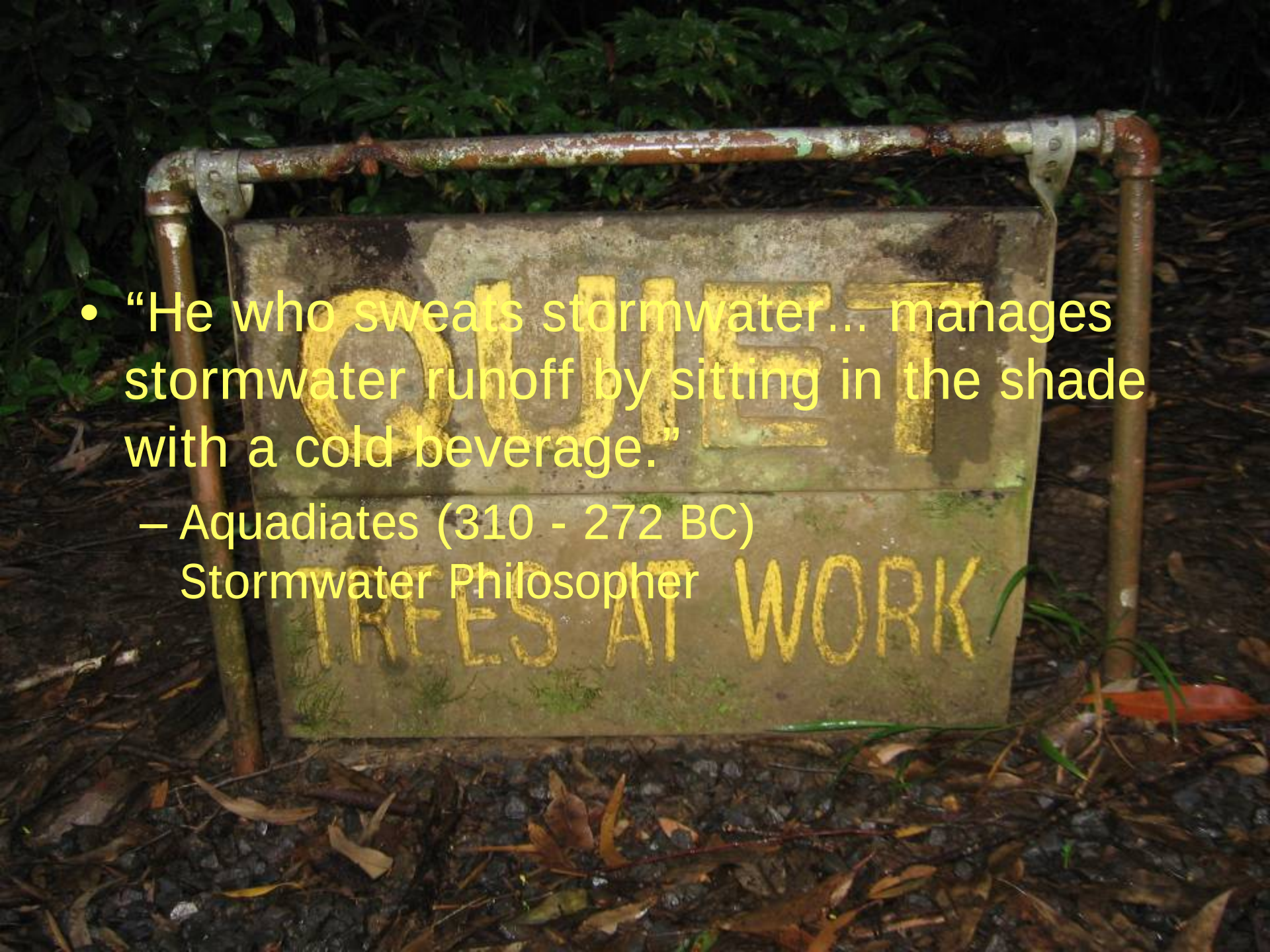
Buffers are applied in varying widths to essential habitat including stream and wetlands depending on the habitat requirements of certain species. The state mandates a 50' buffer for streams that support or could support trout and 25' for other streams, lakes, and marshlands. In addition to these buffers, 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

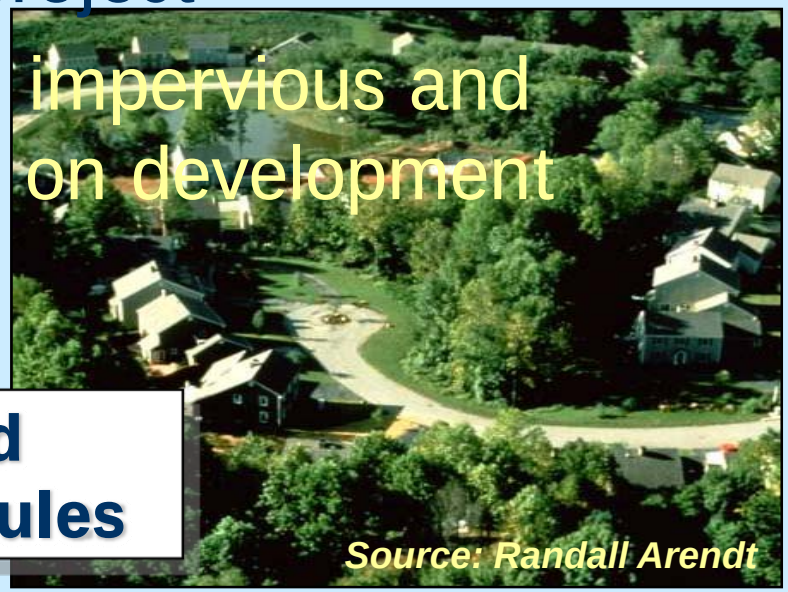
Merrill et al., 2006



- “He who sweats stormwater… manages stormwater runoff by sitting in the shade with a cold beverage.”
  - Aquadiates (310 - 272 BC)
    Stormwater Philosopher

Revise what we are asking for!

- 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



Most likely need to review and revise existing development rules

Revise what we are asking for!

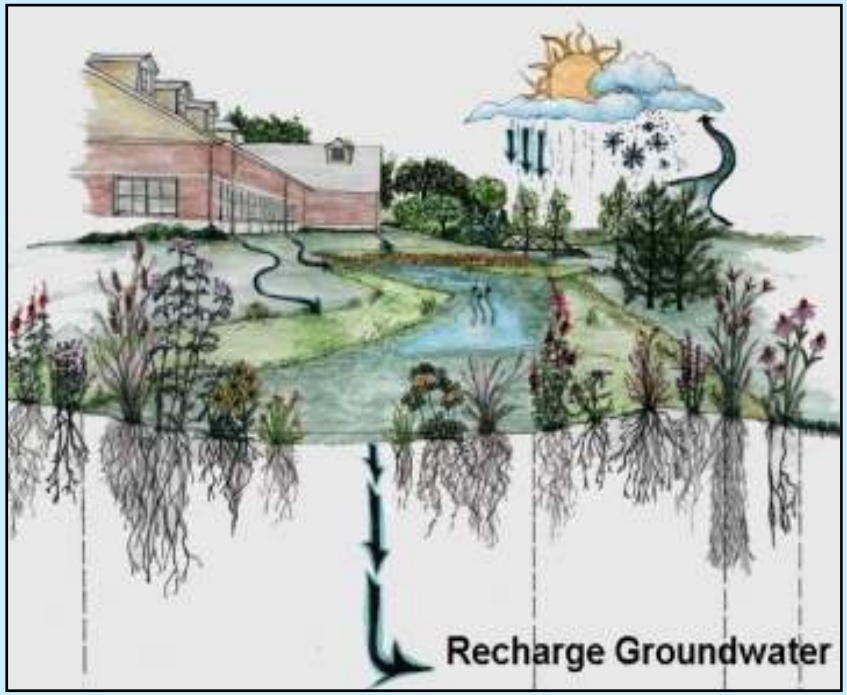
- Stormwater Runoff Reduction Criteria
  - Specify a stormwater runoff volume that must be reduced (instead of captured and treated) on site
  - Encourages use of <u>all</u> practices that reduce stormwater runoff volumes, either implicitly or explicitly

Runoff Reduction Practices

Better Site Planning	Better Site Design	Low Impact Development
• Preserve Primary Conservation Areas • Preserve Secondary Conservation Areas	• Reduce Clearing and Grading Limits • Reduce Roadway Lengths and Widths • Fewer or Alternative Cul-de-Sacs • Reduce Parking Lot Footprints • Landscaping Areas in Parking Lots • Reduce Sidewalk Lengths and Widths • Reduce Building Footprints • Reduce Setbacks and Frontages	• Soil Restoration • Site Reforestation • Conservation Areas • Vegetated Filter Strips • Grass Channels • Simple Disconnection • Rain Gardens • Stormwater Planters • Dry Wells • Rainwater Harvesting • Green Roofs • Permeable Pavement • Bioretention Areas • Infiltration Practices • Dry Swales

Stormwater Runoff Reduction

- Runoff reduction is the total post-construction stormwater runoff volume reduced through the processes of interception, evapotranspiration, infiltration and capture and reuse



Stormwater Runoff Reduction

- Hydrology based
  - Interception
  - Infiltration
  - Evaporation
  - Transpiration
  - Capture and Reuse
  - “Extended Filtration”
- Runoff reduction ≠ infiltration
  - When infiltration is not feasible, 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

Runoff Reduction Practices

- Using the results these monitoring studies, practices can be quantifiable stormwater management “credits” that can be used to help satisfy the runoff reduction (and other stormwater management) criteria, that applies to a development site

Low Impact Development 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*.

Benefits of Stormwater Runoff Reduction

- Helps maintain pre-development hydrologic conditions (e.g., runoff rates and volumes, groundwater recharge)
- Helps protect aquatic resources from several indirect impacts of the land development process (e.g., decreased groundwater recharge, decreased baseflow, degraded water quality)
- Enhances reliability of and capability to provide pollutant load (mass) reductions on development sites
- Provides **common basis** for measuring the performance of green infrastructure practices and traditional stormwater management practices
- Associated “credits” encourage natural resource conservation and reduction in new impervious and disturbed pervious cover

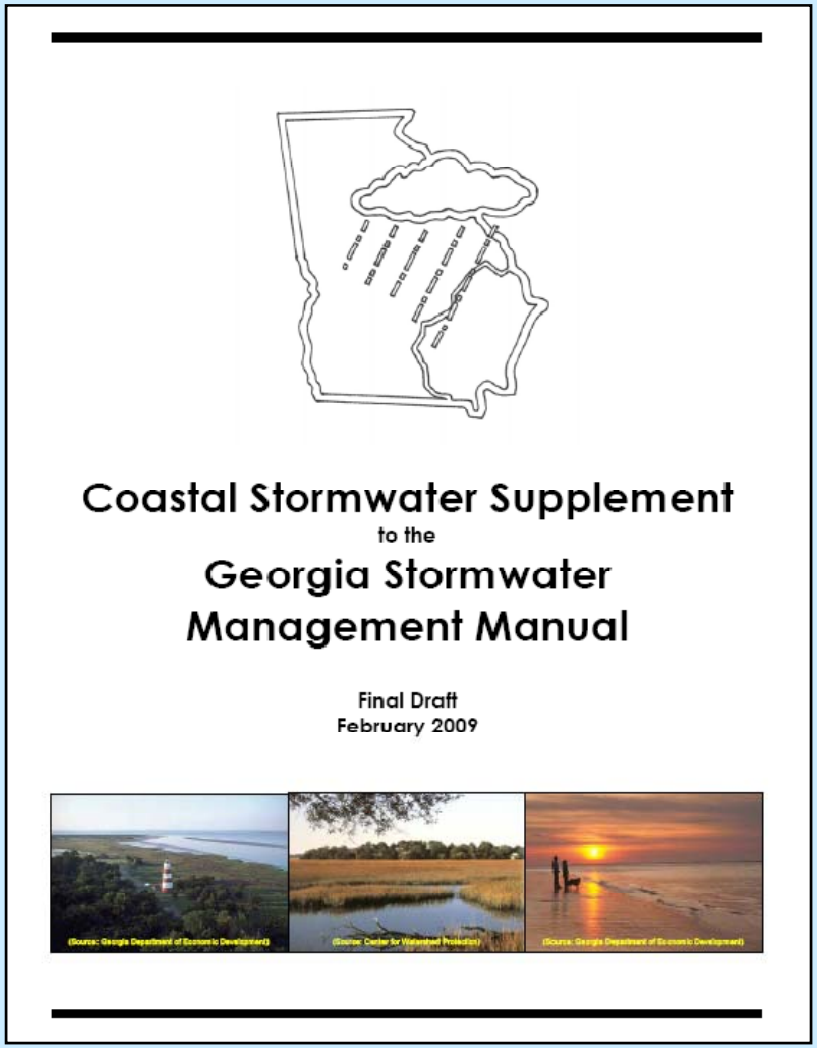
Stormwater Runoff Reduction

- A number of states and communities have begun to incorporate the concept of runoff reduction into their stormwater management criteria
  - Encourage the use of green infrastructure practices
  - Better protect natural resources from the negative impacts of land development

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	Proposed
Virginia	Runoff reduction practices can be used to help meet established nutrient (e.g. phosphorus, nitrogen) load reduction goals at development sites	Proposed

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" of the stormwater runoff volume 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**

- Includes all of the recommendations discussed in this presentation, plus:
  - Information about the valuable natural resources found in coastal Georgia
  - Detailed guidance on the site planning & design process, including an accompanying spreadsheet
  - Guidance on adapting BMP design to characteristics and constraints encountered in coastal plain



http://www.mpcnaturalresources.org/water-resources/georgia-storm-water.html

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