



Outdoor Water Conservation and Sustainable Landscaping Green Business Challenge



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Charleston, SC

ASHLEY COOPER
STORMWATER EDUCATION CONSORTIUM

 **Carolina
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GREEN MEANS GREEN.



30 BILLION REASONS WHY LIFE'S BETTER OUTDOORS

THE ECONOMIC IMPACT OF SOUTH CAROLINA'S NATURAL RESOURCES

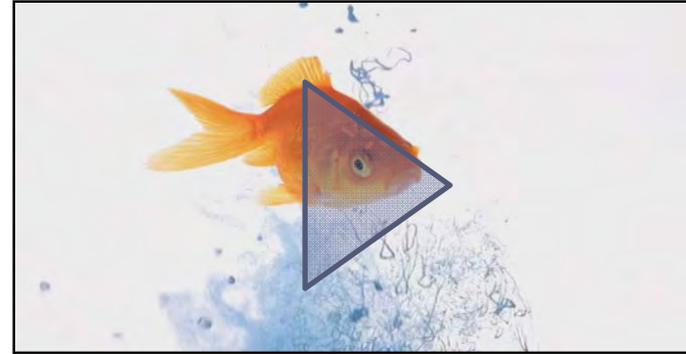
DIVISION OF RESEARCH

2009

Just the facts:

- SC's environment employs 236,1110 people
- \$30 billion is the ANNUAL estimated value of goods and services from natural resource-related businesses
- Fishing, hunting & wildlife viewing bring almost \$4 billion to the state's economy
- Coastal tourism (not inc. historic) amounts to \$7 billion in the annual economy and employs 80,000+

+ We all live downstream...

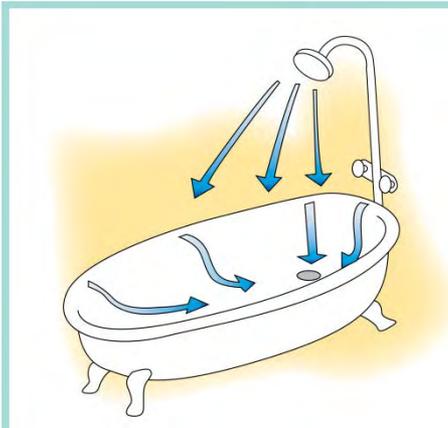
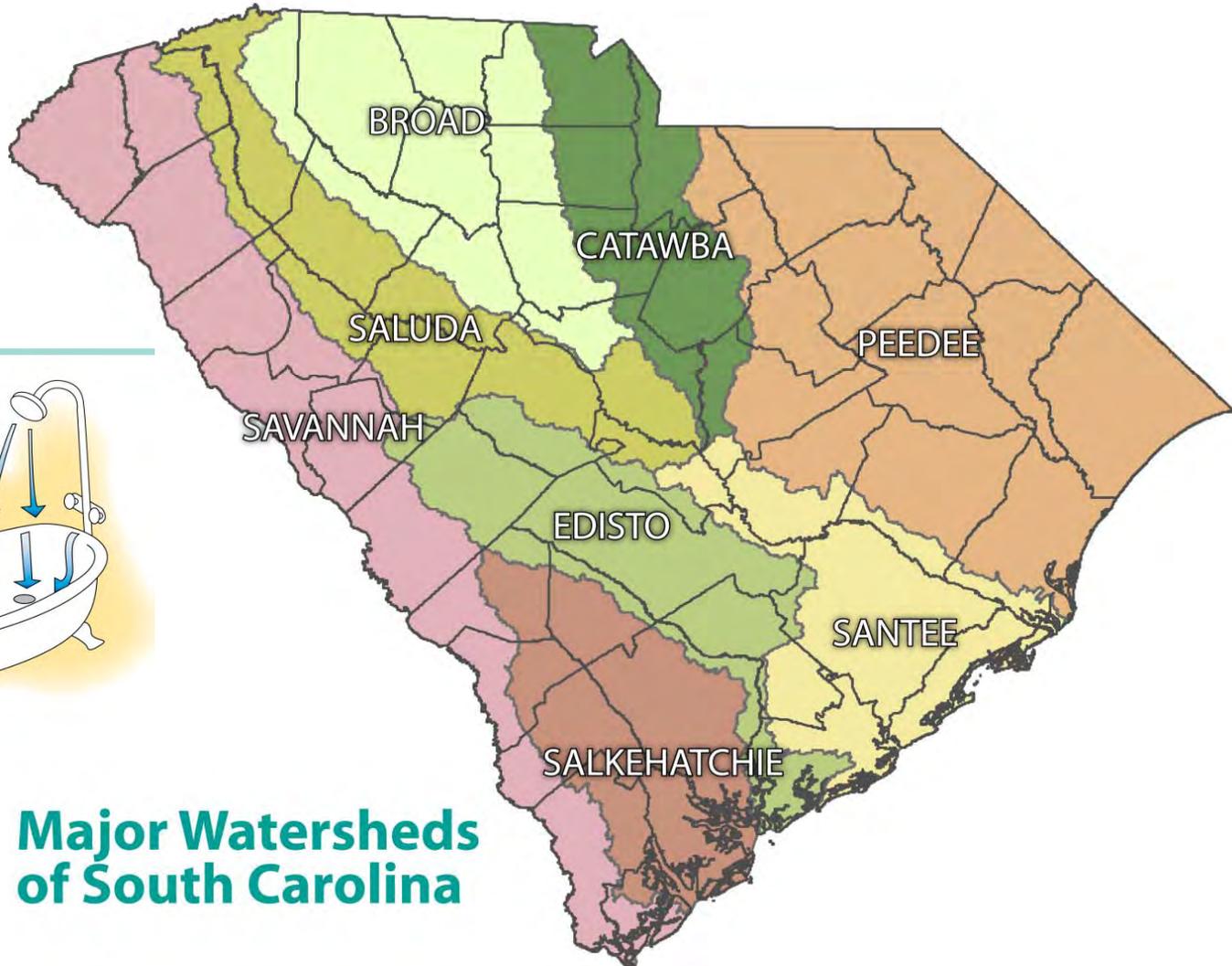


- *Polluted runoff is the #1 water quality problem in South Carolina and the country.*
- *40% of our lakes, rivers and creeks are listed by DHEC as impaired.*
- *Stormwater is a problem we all participate in and have the opportunity to fix.*



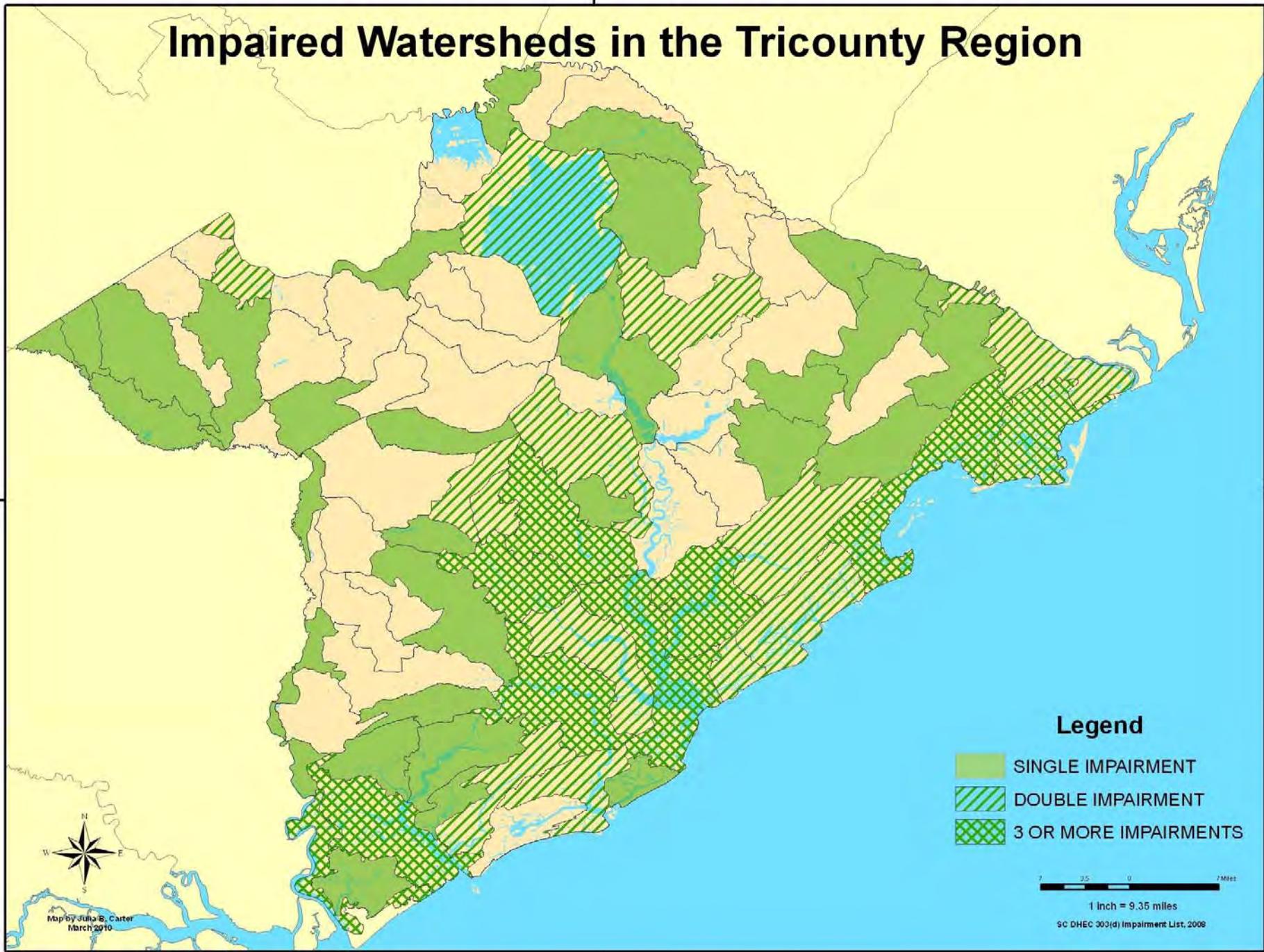


Watersheds connect us all. What we do on the land affects the health of our water resources.



**Major Watersheds
of South Carolina**

Impaired Watersheds in the Tricounty Region



Legend

-  SINGLE IMPAIRMENT
-  DOUBLE IMPAIRMENT
-  3 OR MORE IMPAIRMENTS

0 2.5 5 7.5 Miles

1 Inch = 9.35 miles

SC DHEC 303(d) Impairment List, 2008



Map by Julia B. Carter
March 2010



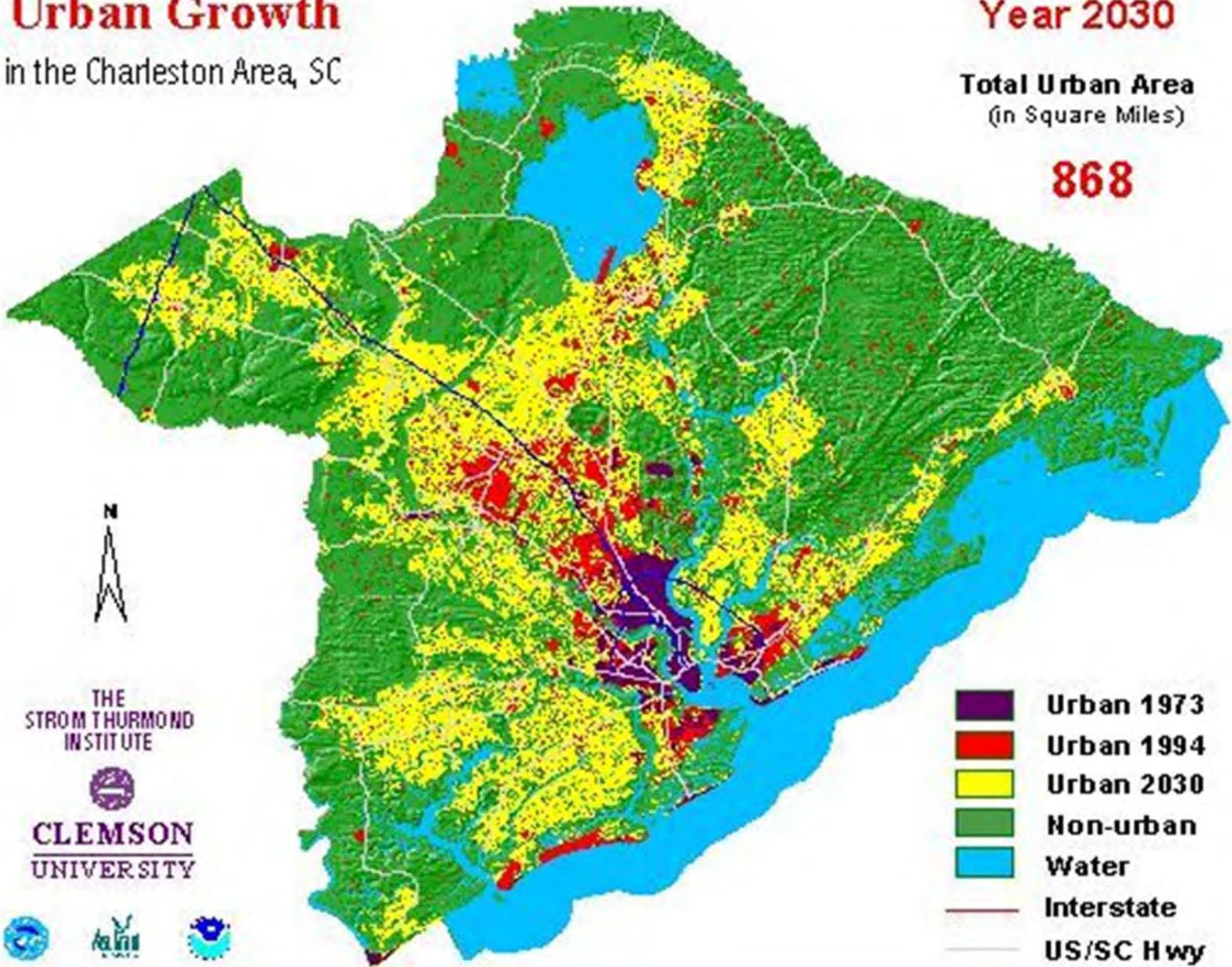
Urban Growth

in the Charleston Area, SC

Year 2030

Total Urban Area
(in Square Miles)

868



THE STROM THURMOND INSTITUTE

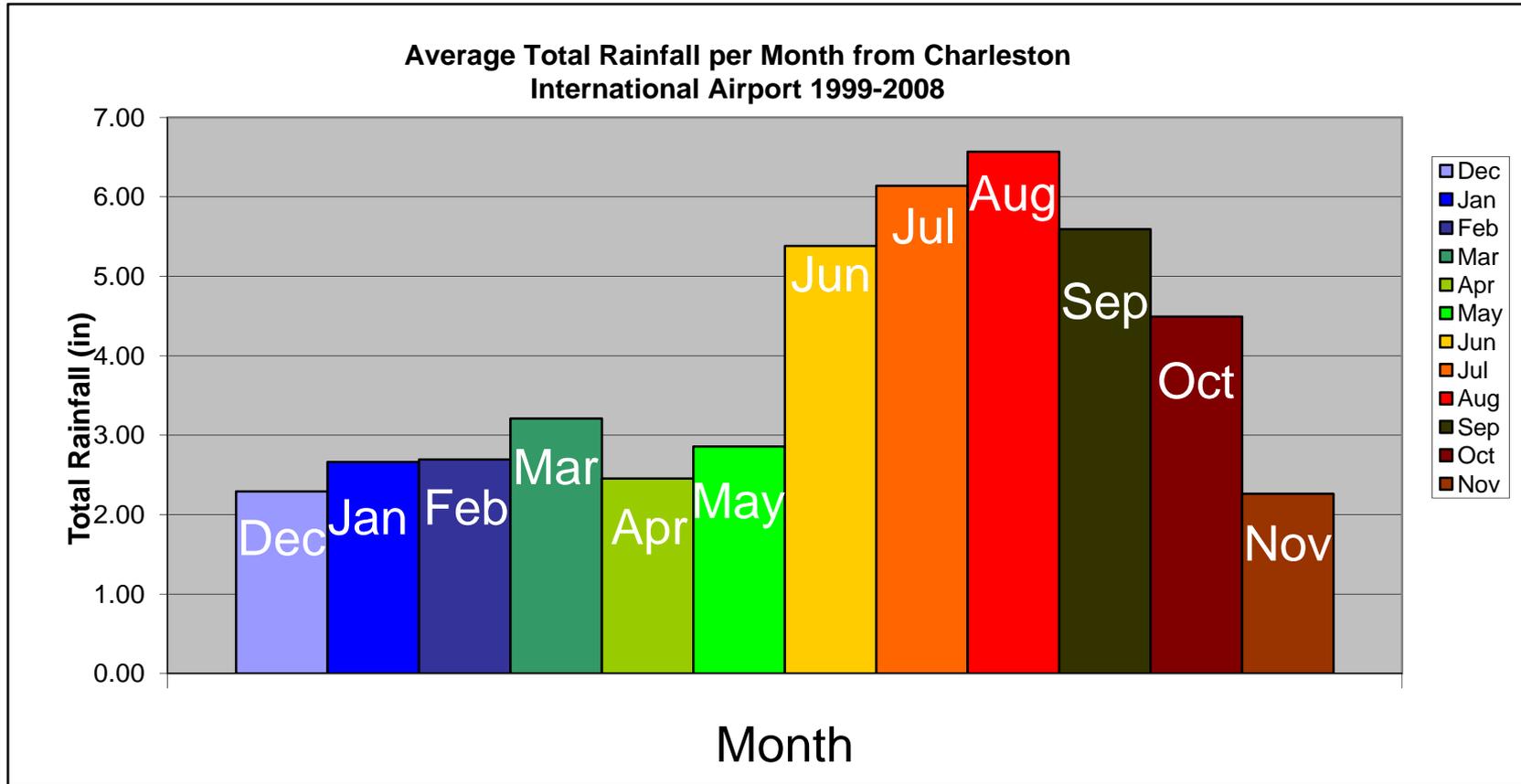
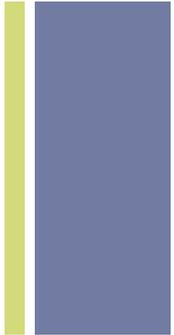


CLEMSON UNIVERSITY

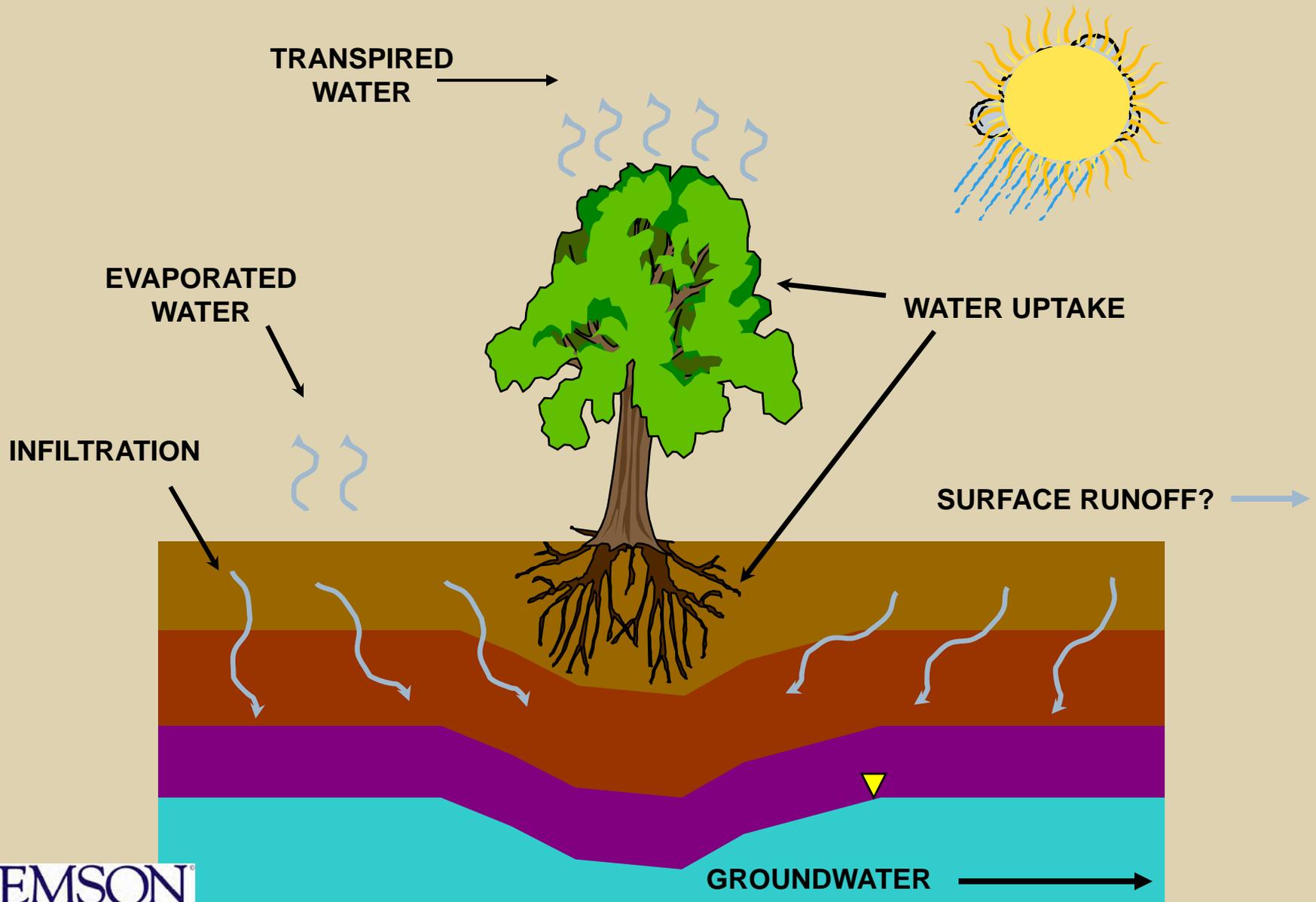


-  Urban 1973
-  Urban 1994
-  Urban 2030
-  Non-urban
-  Water
-  Interstate
-  US/SC Hwy

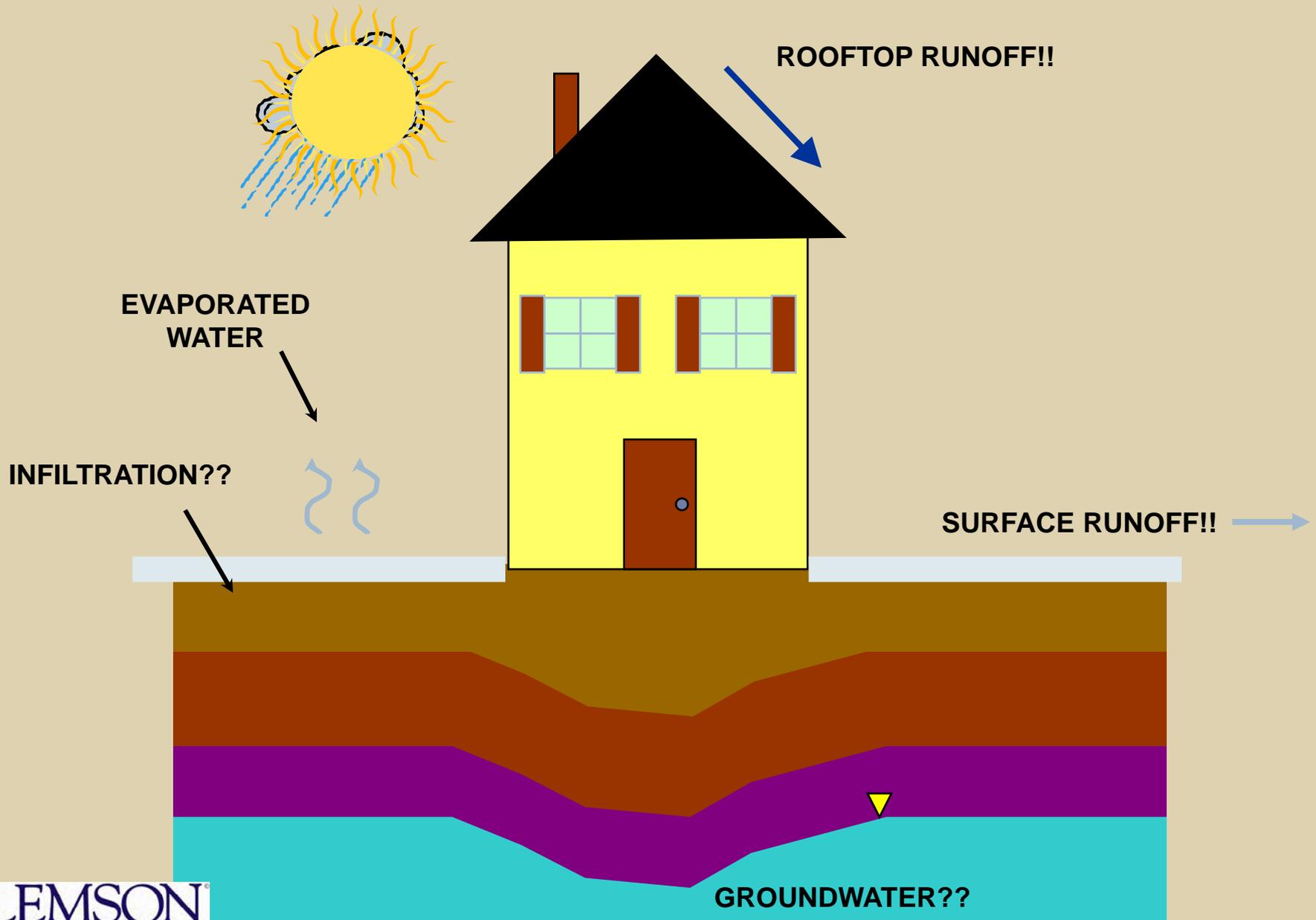
+ Water Budget $I - O = (+/-)S$



Forest Water Budget – Typical Scenario

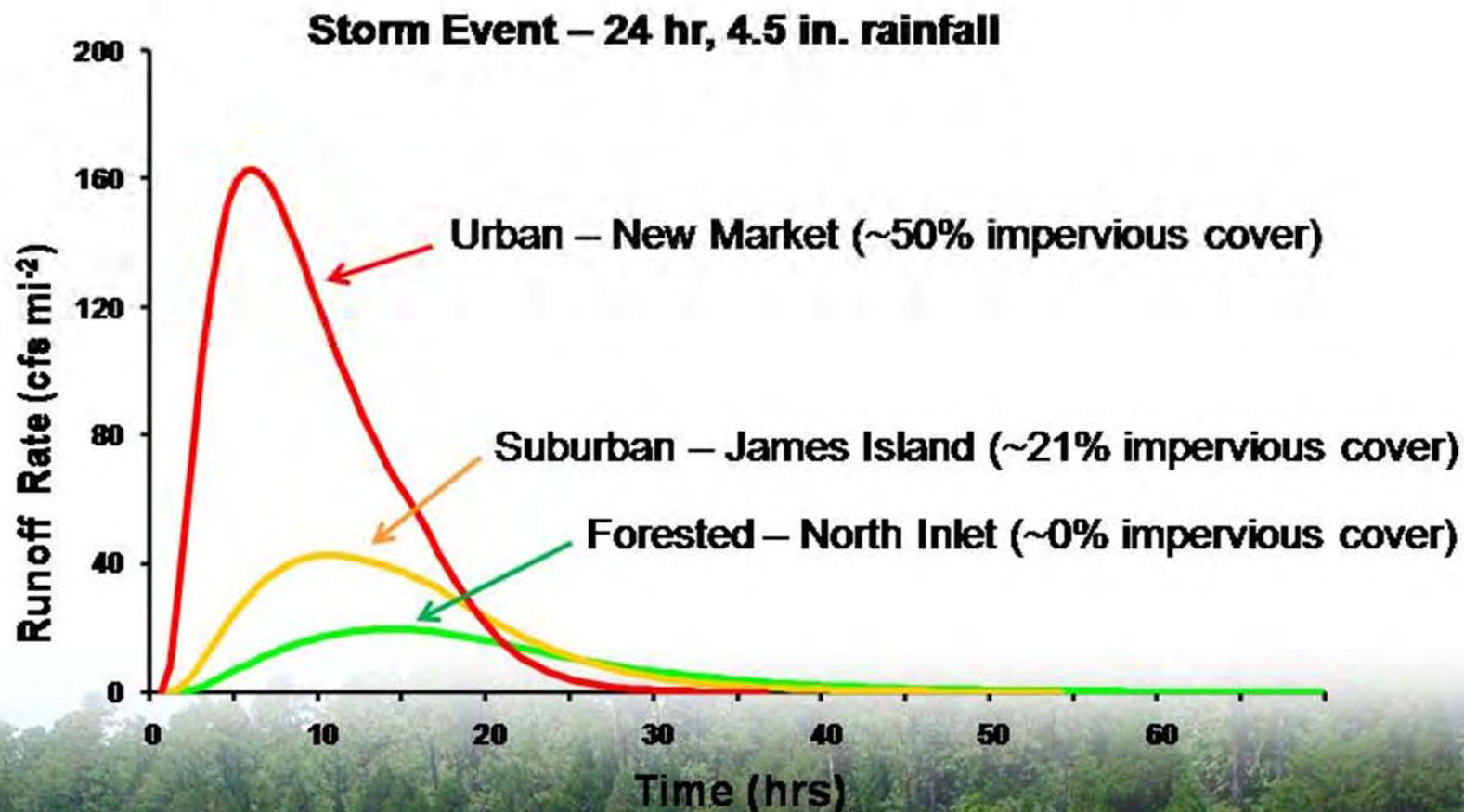


Urban Water Budget – Pavement and Rooftop Scenario





Stormwater Runoff Rate Comparisons of Urban, Suburban, and Forested Sites in the Charleston, SC region

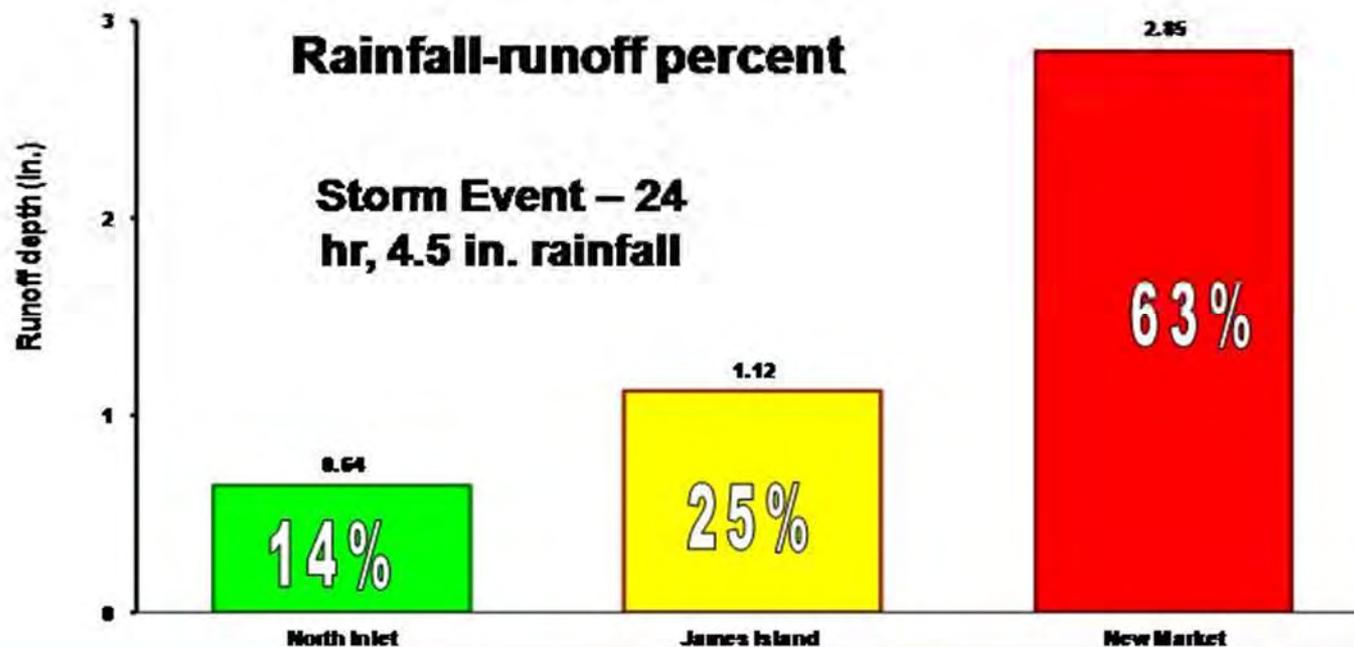


Anne Blair 2008

NOAA / NCCOS / Hollings Marine Laboratory, Charleston SC

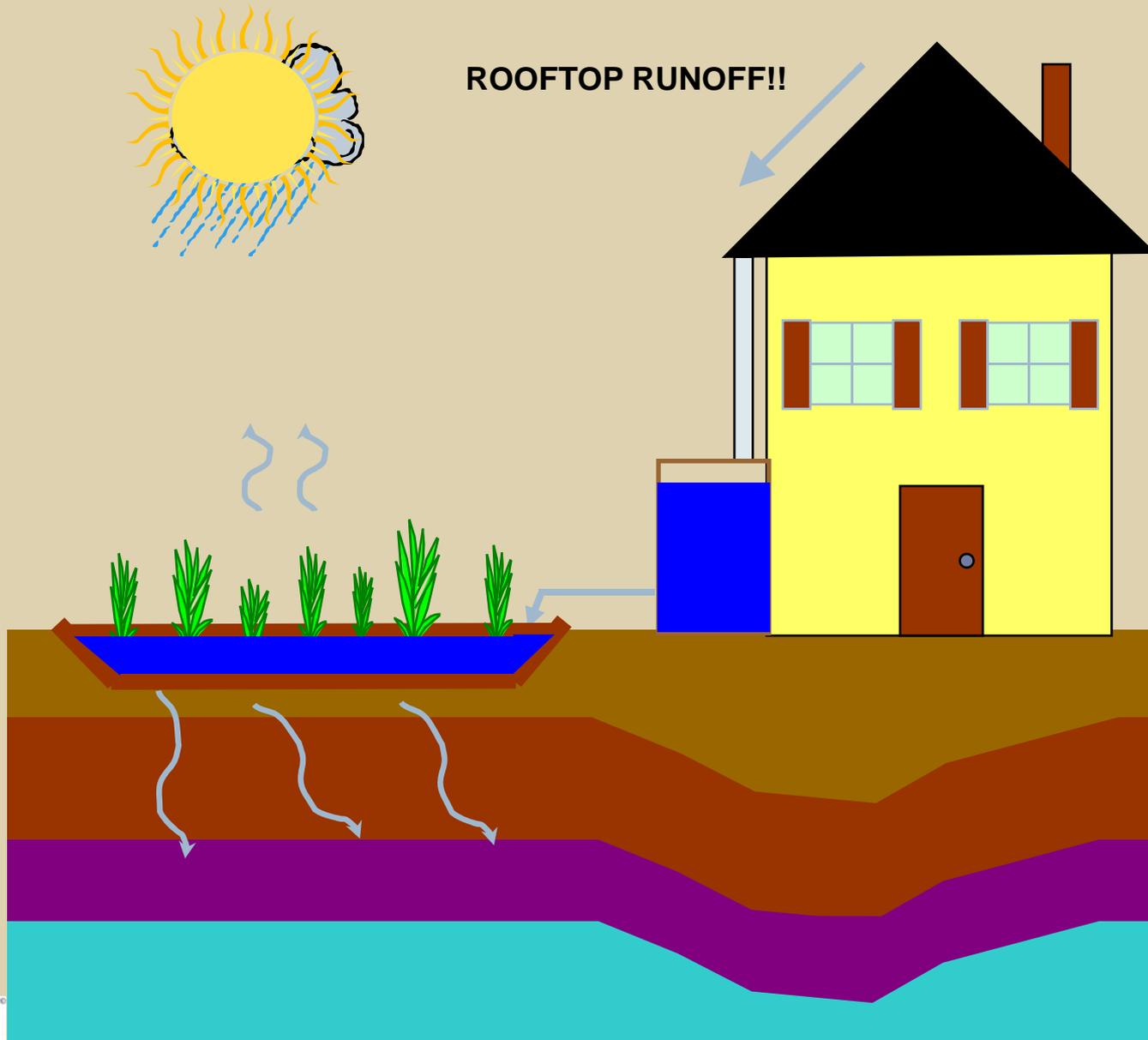


Stormwater runoff amount increases with development



Intertidal Watersheds – South Carolina

Urban Water Budget – Rainwater Harvesting Scenario



+ Types of Stormwater Management Practices

■ Conveyance:

- Open channel (swales and ditches)

■ Storage:

- Stormwater ponds / lakes
- Stormwater wetlands
- Rainwater Harvesting

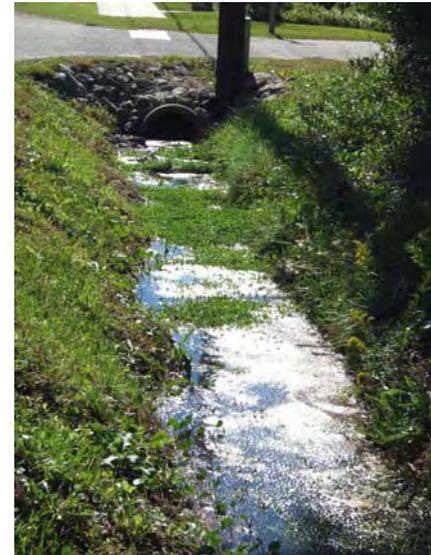
■ Infiltration

- Pervious surfaces
- Rain gardens or Bioretention



Open Channel – Swales, Ditches, Canals

- Allows relatively rapid movement of stormwater
- Slows flow to allow sediment settling and some infiltration
- Can be attractor for wildlife and associated bacteria



+ On-Site Green Practices

Allow swales (ditches) to be vegetated – no
mow zones



+ Open Channel – Swales, Ditches, Canals



Stormwater Ponds / Lakes



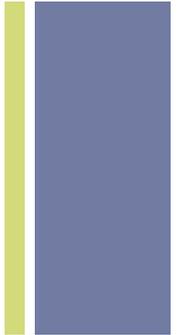
+ Stormwater Ponds / Lakes

■ Advantages

- manages stormwater *quantity*
- traditional...everybody's doing it
- aesthetically pleasing
- good at removing sediment and solids

■ Disadvantages

- relatively land intensive
- safety issues
- poor removal of nutrients
- pathogen sink or source? TBD...



Pollutant Sources into Ponds

- Fertilizers (primarily nitrogen and phosphorus)
 - Nitrates – water soluble and moves with rain
 - Phosphorus – sediments
- Pesticides – runoff
- Bacteria (pets, humans, wildlife)
- Sediment (construction activities)
- Other pollutants



Considerations for Stormwater Ponds

- Homeowner activities
- In pond management strategies
- Buffers
- The “M” word = MAINTENANCE

Stormwater Management

Homeowner Activities

- Deliberate and conservative irrigation – stay off sidewalks!
- Fertilize only when needed – Clemson can help!
- Pesticide management
- Keep debris, yard waste, and leaves out of storm drains
- Collect and properly dispose of pet waste



Vegetated Buffers

- **Buffers:** corridors of native vegetation along rivers, streams, and tidal wetlands that protect waterways by providing a transition zone between upland development and adjoining surface waters (SC DHEC-OCRM, 2002).

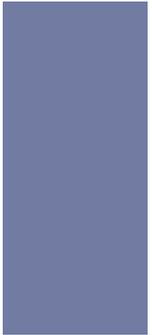


Stormwater Ponds

Buffers

- Vegetated buffer strips
- Don't mow to the edge
- Plant native vegetation
- Slows stormwater flows and adds treatment
- Stabilizes banks and shorelines
- Littoral shelves or aquatic “benches”





**This looks like a great place for
Ahhhh, much better!!!
a vegetated buffer strip...**

Stormwater Ponds

Maintenance



- Developer to homeowner
- Who, what, when, how?
- HOA/POAs or homeowner?
- Ordinances or neighborhood covenants?
- Education and outreach programs available



Other Ideas for Stormwater Management??

- Rain gardens ✓
- Rainwater harvesting ✓
- Buffers ✓
- Pervious materials
- Backyard wetlands
- Maintenance!!!



Homeowner Applications – Landscaping Ideas Using Pervious Surfaces

Gravel Paths, Vegetated Buffers, and Mulched Areas



Old Brick Pavers for Sidewalks



Block Pavers for Curved Sidewalks



Driveway Grass or Turf Strips



Infiltration - Pervious Pavers and Concrete



Alternatives to conventional surface materials

Increases chances for infiltration

Expensive

Maintenance

Weeds and clogging





MAY 16 2001

Source: City of Portland, OR

Bioretention – a Variety of Designs



From the Certified Stormwater Plan Reviewer (CSPR) course

Stormwater Wetlands



Benefits from Using Stormwater Wetlands

- Good nutrient removal
- Aesthetically pleasing
- Provides natural wildlife habitat
- Relatively low maintenance costs
- Relatively low operations costs and energy use
- Great educational tools!

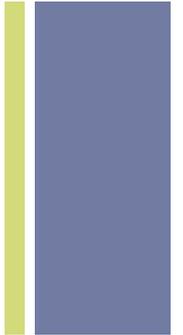


Limitations to Using Stormwater Wetlands

- Mosquito issues
- Invasive vegetation
- Nuisance “critters”
- Odor can be an issue
- Needs continuous baseflow for viable wetland
- Sediment regulation is critical to sustain wetlands



+ Factors Influencing Plant Selection



- Climate
 - ❖ Temperature
 - ❖ Latitude/solar radiation
 - ❖ Rainfall
- Nutrient loading
- Water depth
- Upland soil characteristics
 - ❖ Texture
 - ❖ Permeability
 - ❖ Organic content
- If possible, stick with native species!!



Stormwater Management Strategies

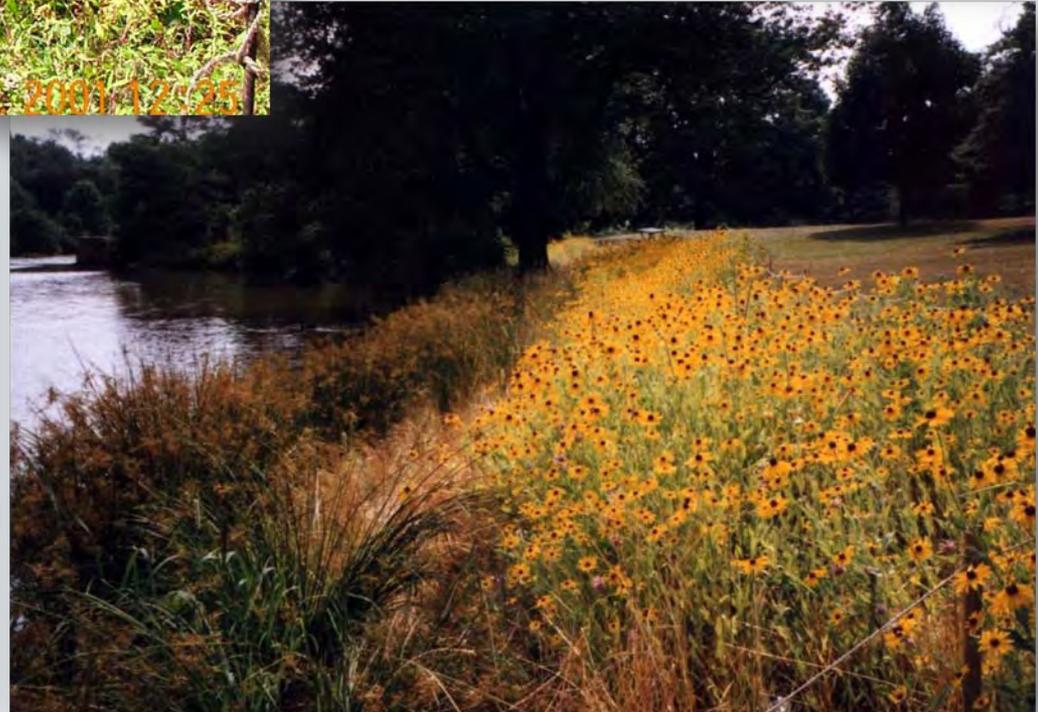
The “M” word = **MAINTENANCE!**

- The critical way to ensure stormwater mgmt success
- Must have a plan!! Who, what, when, where, how, how often?
- Many maintenances practices from which to choose
- Education and outreach programs available



Education and Outreach!!







**For more
information....**

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