

# *Watershed Academy: Principles of Water Quality Monitoring, Planning, and Restoration*

Sponsored by:  
USDA CSREES Southern Region Water  
Quality Program  
Clemson University  
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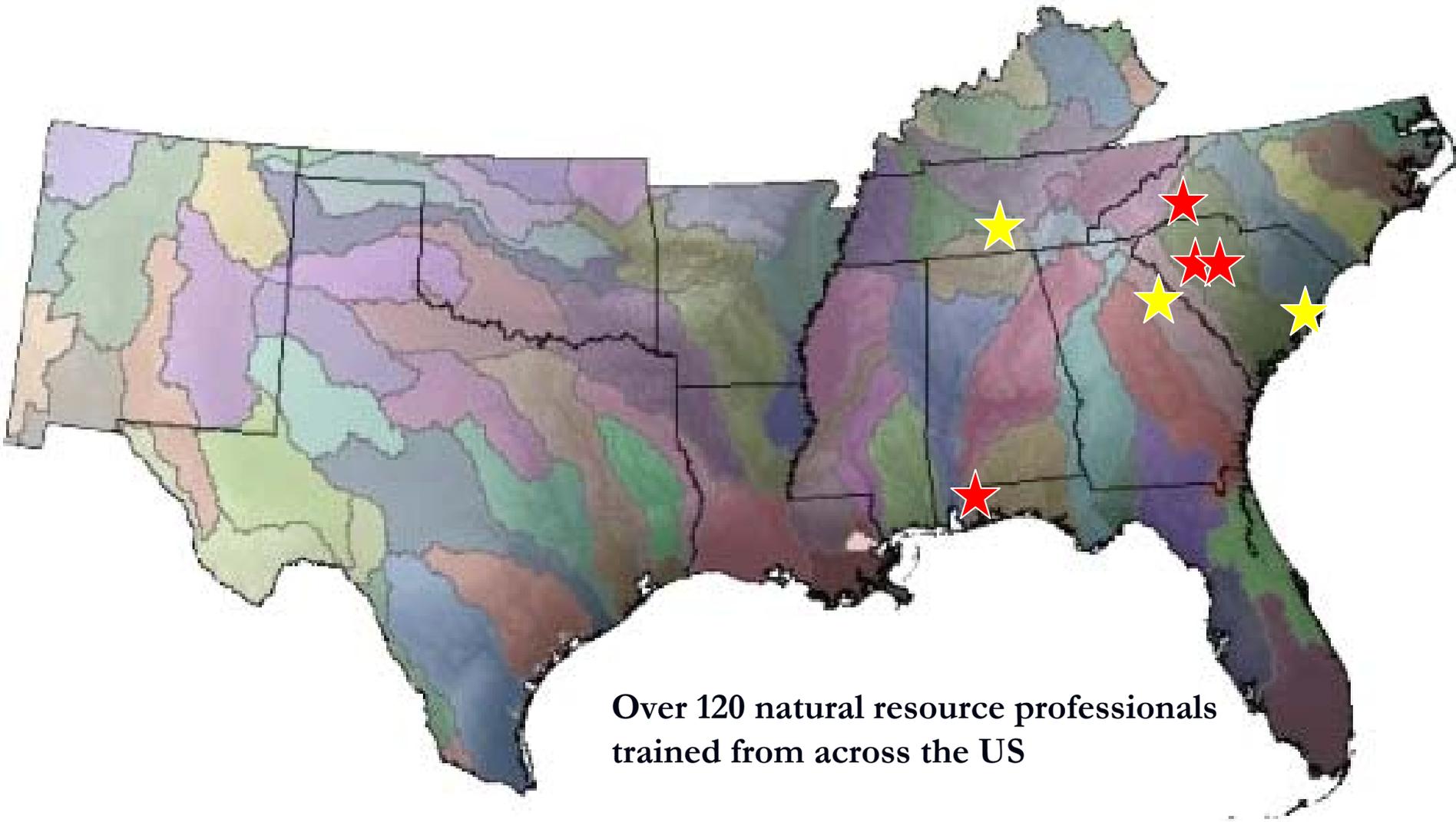


# Watershed Academy

- Watershed Science Basics – Hands-On:
  - Science
  - Solutions
  - Sociology



# 4 Academies completed – 3 planned



Over 120 natural resource professionals  
trained from across the US



# For those who want more ...

- The Watershed Academy provides a starting point for 'Advanced' trainings:
  - Stormwater BMP Intro & Design
  - Stream Restoration Intro & Design
  - NEMO
  - LID



# Introduction to Watersheds:

## *Hydrology & Water Quality*

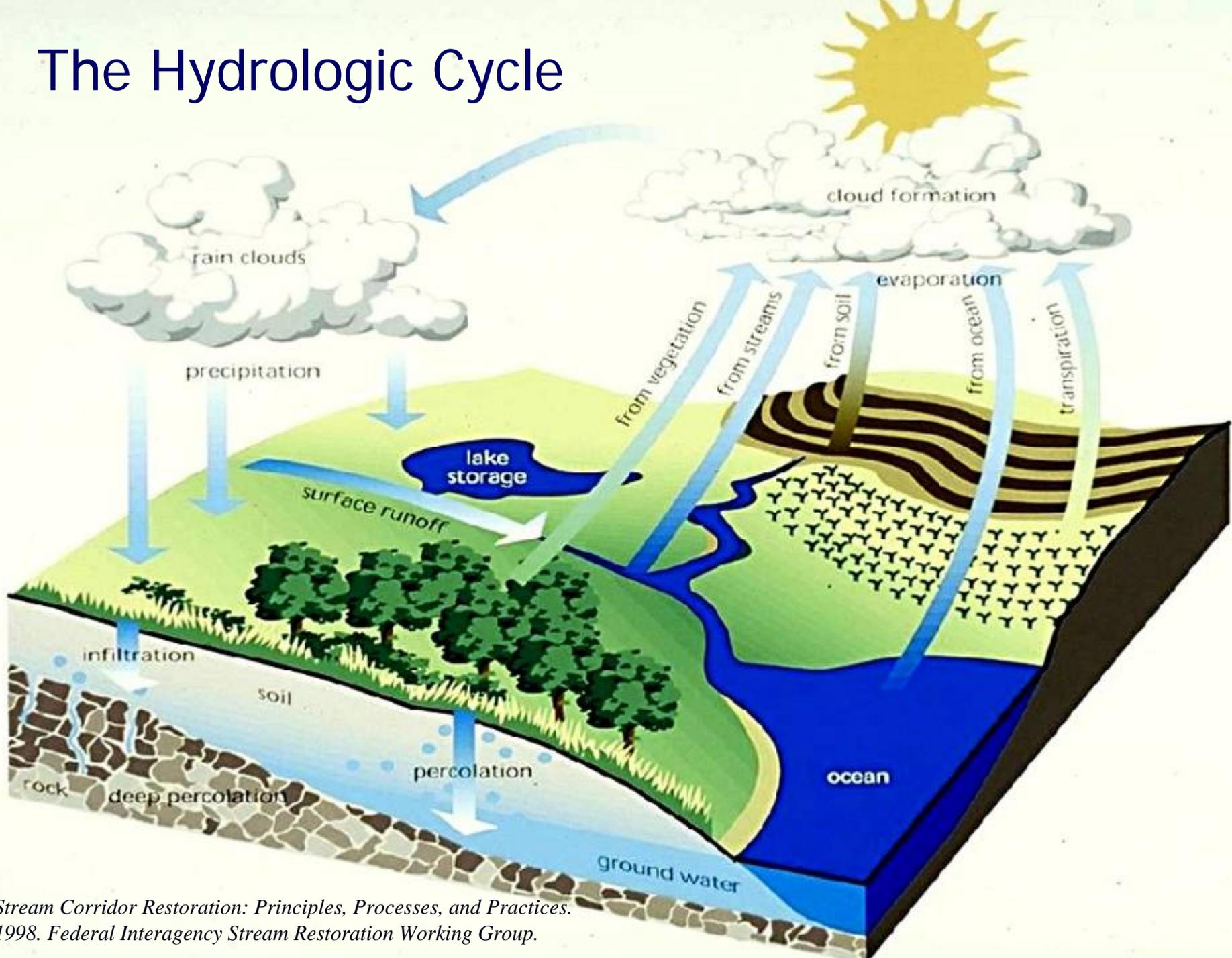


Watershed Academy

Greg Jennings, PhD, PE

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# The Hydrologic Cycle



# Hydrologic Responses to Urbanization

1. Increased discharge
2. Increased peak discharge
3. Increased velocities
4. Shorter time to peak flow
5. More frequent bankfull events
6. Increased flooding
7. Lower baseflow
8. Less ground water recharge



Urban channelized and “hardened” streams (left) are poor habitat but route stormflows quickly. Natural streams below urban areas (right) retain some habitat features but become heavily eroded by flows from increased urban runoff.

# Stream Functions

1. Transport water
2. Transport sediment
3. Habitat (aquatic & terrestrial)
4. Recreation
5. Aesthetics
6. Safe Water Supply



# Stream Channel Morphology

*size and shape of the channel*

## Influenced by:

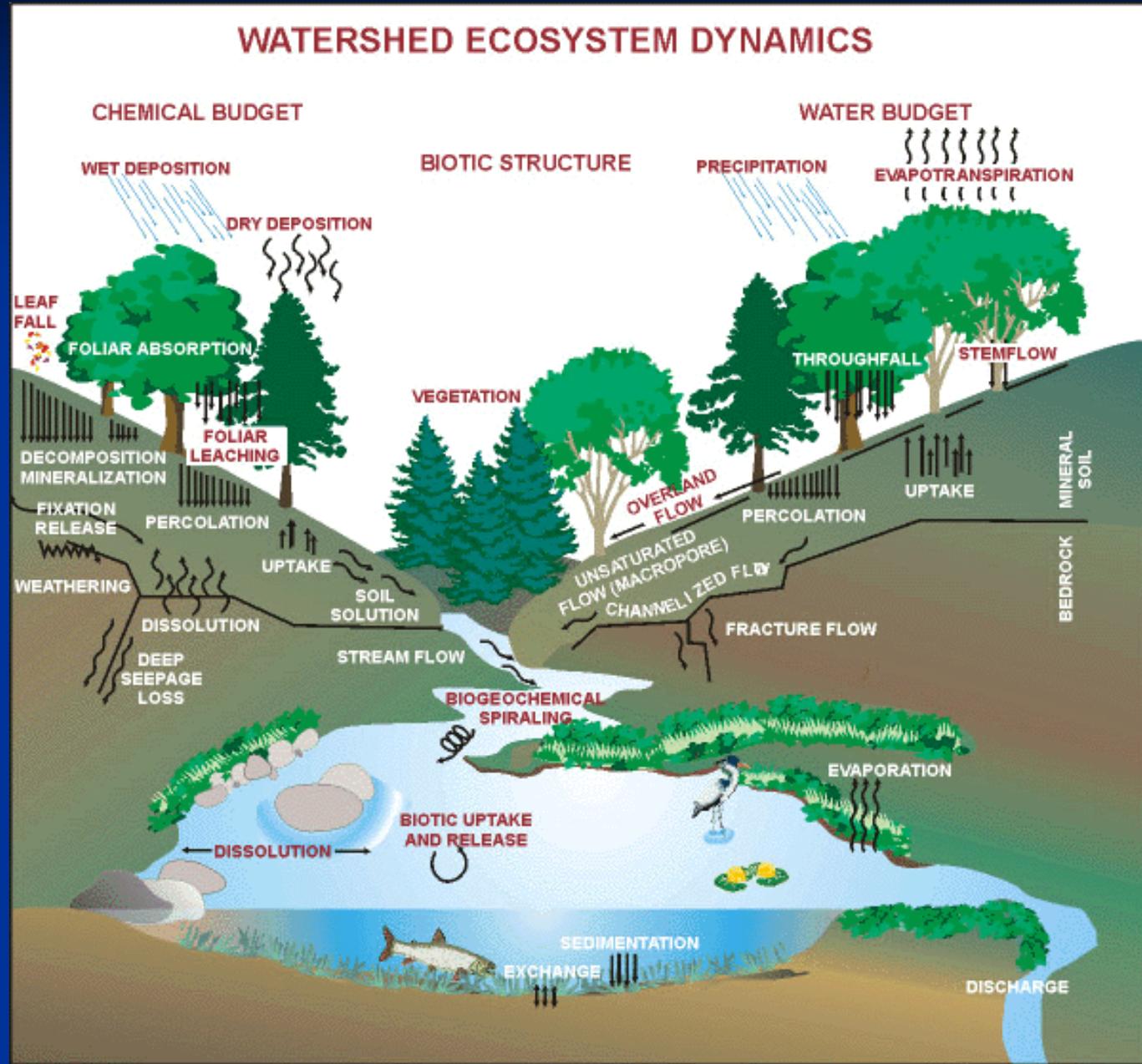
- Watershed area
- Land use and land cover
- Soils and geology
- Topography
- Climate
- Human impacts  
(intentional or not)



# Water Quality

Influenced by:

1. Geology & Soils
2. Land Use
3. Pollution Sources
4. Flow Conditions



# Where Does Pollution Come From?

## *Nonpoint Sources*

**Agriculture**



**Stormwater**



## *Point Sources*



**Forestry**



**Construction**



# Challenges

## Water quality problems:

1. Watershed-scale
2. Result from many diffuse sources
3. Difficult to diagnose
4. Related to local land uses



# Watershed Restoration

- Streams
- Riparian Buffers
- Wetlands
- Watersheds
- Ecosystems



# Goals of Restoration Projects?

Enhance functions of natural systems

1. **Physical:** Hydrologic & geologic
2. **Chemical:** Water quality improvement
3. **Biological:** Habitat (optimal & diverse)
4. **Society Value:** Recreation & aesthetics



# Stream Restoration:

## *Natural Channel Design Approach*

1. Stream channel morphology
2. Floodplain connection
3. Instream structures
4. Streambank stabilization
5. Riparian vegetation
6. Habitat enhancements?



# Replace conventional drainage ditches with constructed streams and riparian floodplain

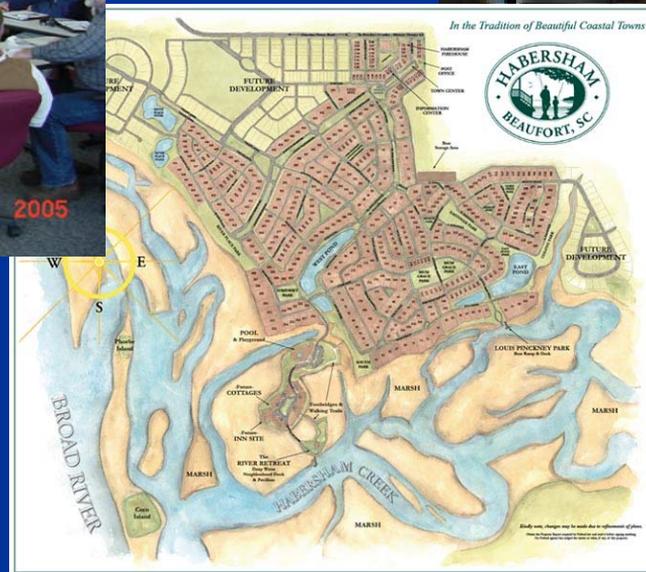


# Restoration

1. Think functions
2. Think natural
3. Be creative



# Working With Developers



Deb Borden  
University of Georgia

# Why Developers?

- Limited success getting local officials to the table
  - Limited time, constituent support
  - The usual challenges...
- Maybe a better strategy?



# Why Developers?

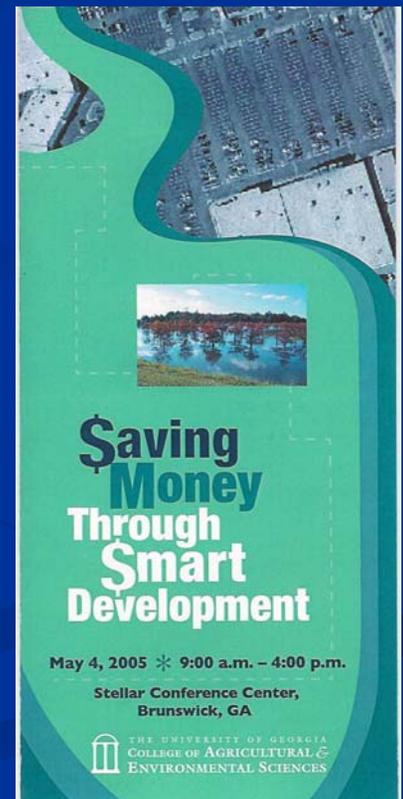
- Idea! Focus on developers



- Significant influence on local politics
- Teach 'em about Low Impact Development
- Local officials will follow developers' lead

# Coastal Developer Seminar

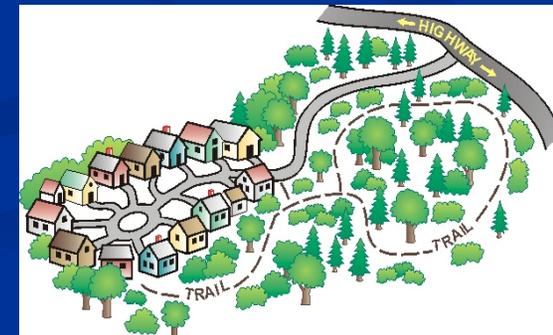
- Developers – a tough bunch!
- Need to gain credibility off the bat
  - No second chances!
- Start with a one-day informational seminar
  - Baby steps!



# Working With Developers: Lessons Learned



- Involve local folks in planning
- Bring in LID experts that are familiar with a “developer’s world”
- Bring in successful local developers
- Baby steps! Get them interested first!



# Working With Developers: Lessons Learned



- Focus on building trust & credibility
- Invite developers & local officials personally
- Use multi-price point development examples
- Follow up initial workshop with focused technical and local ordinance workshops



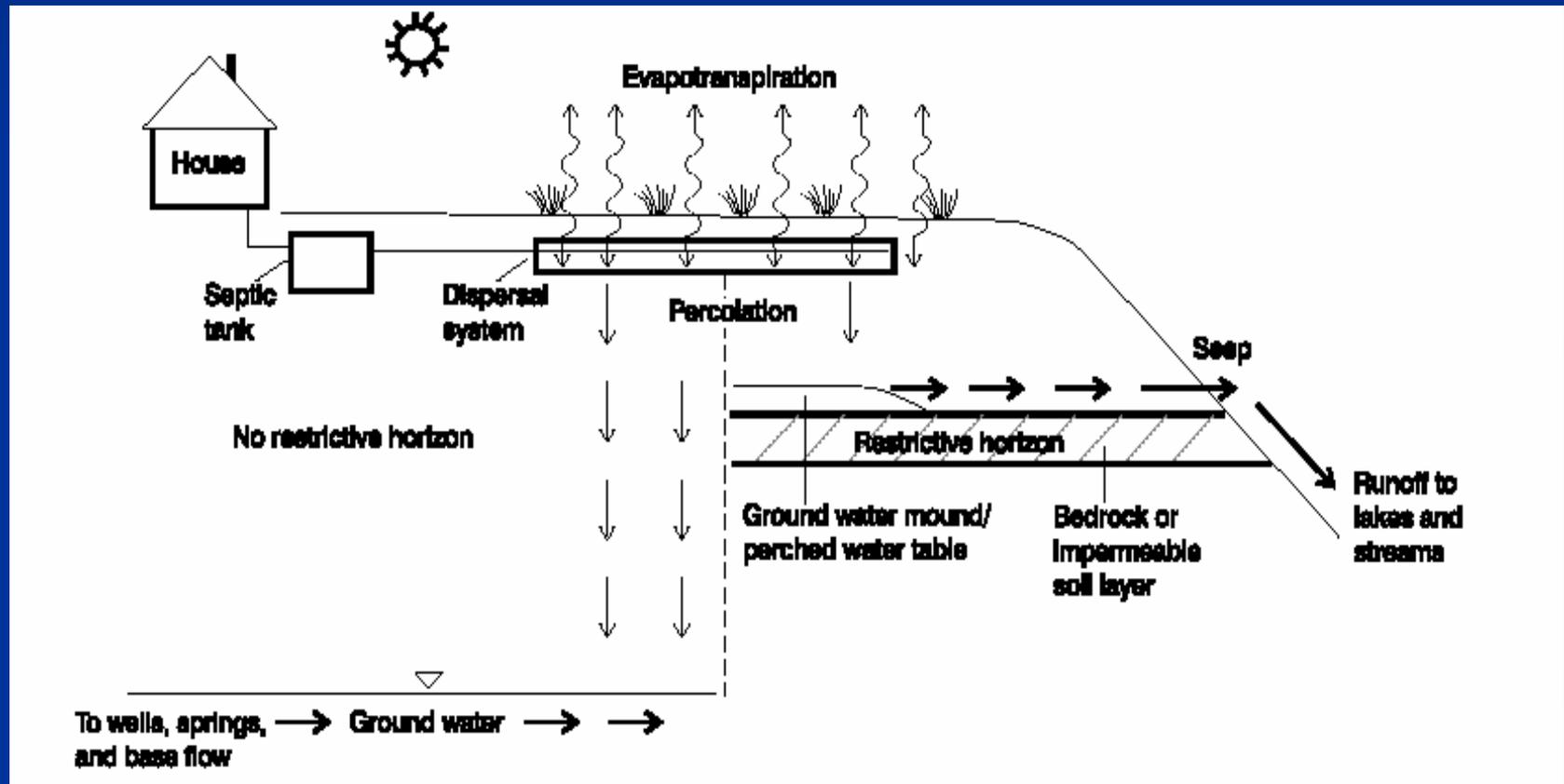
# Septic System Issues & Solutions



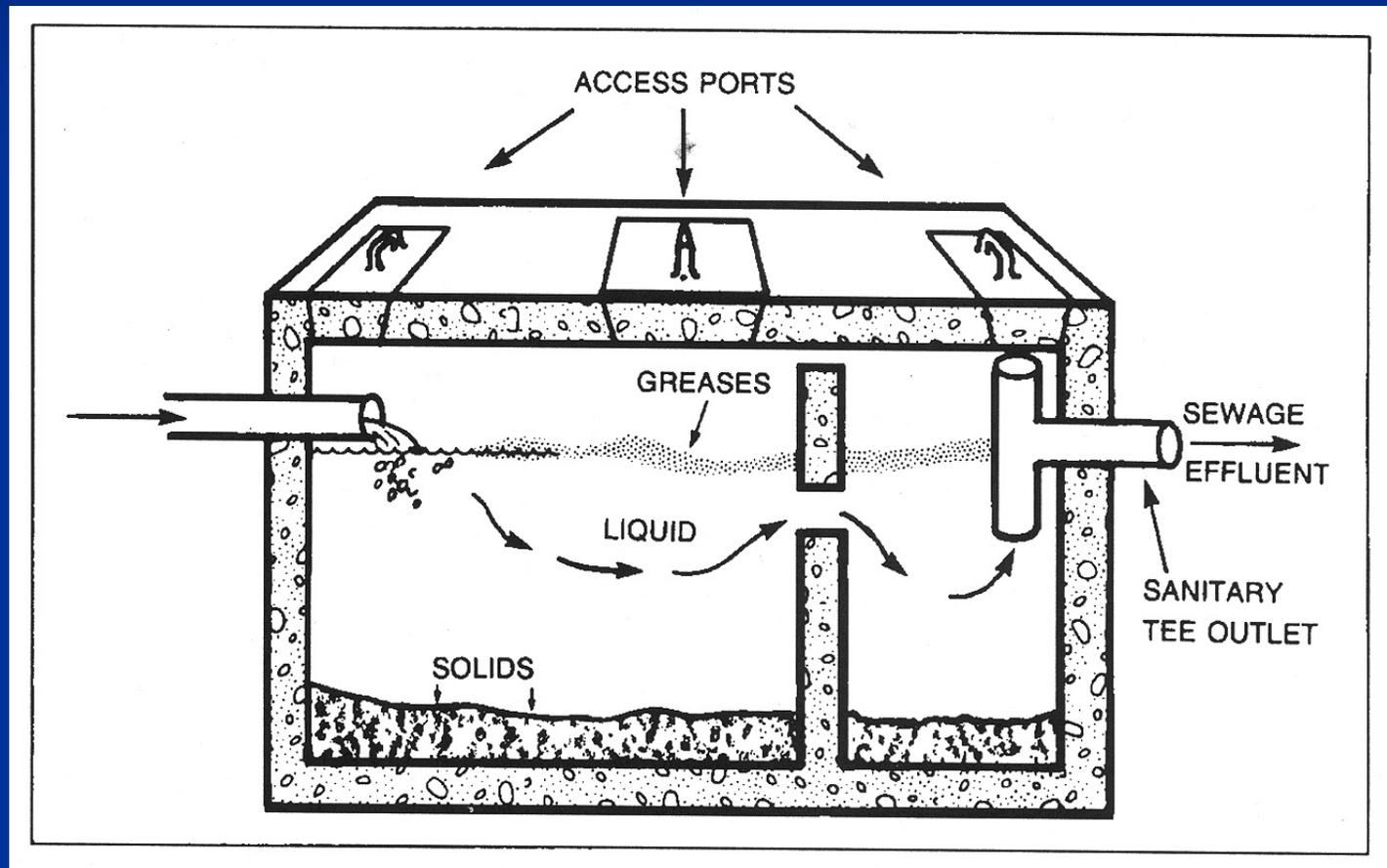
Deb Borden

University of Georgia

# On-Site System Components

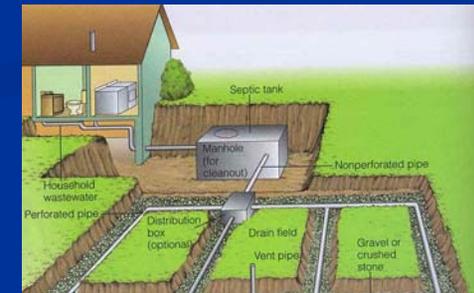


# Septic Tank



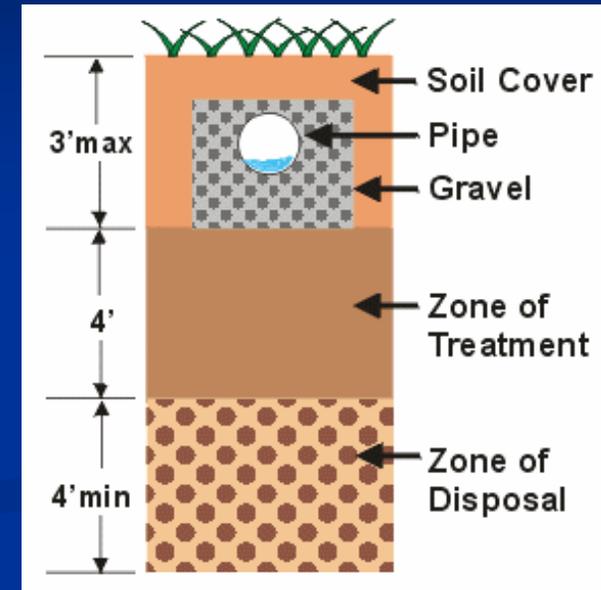
# On-System Failure Types

- Partially treated wastewater rising to the soil surface
- Wastewater backs up into house
- Inadequate treatment before entering groundwater



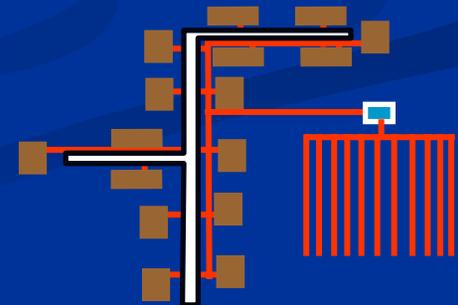
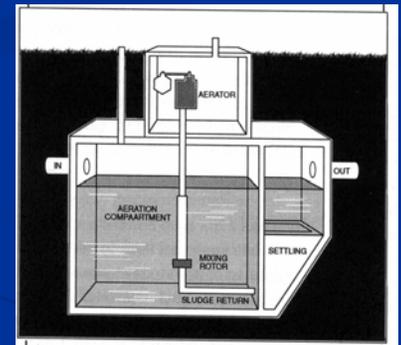
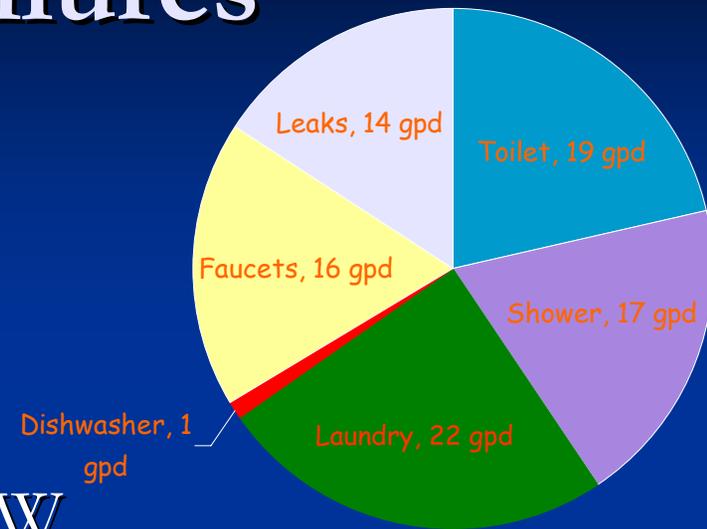
# Common Causes of Failure

- Unsuitable soils
- Construction faults
- Site water management
- Under-designed system
- Lack of homeowner understanding and maintenance
- Nothing lasts forever



# Preventing Failures

- Water conservation
- Graywater separation
- Reduce contaminant loads in WW
- Avoid additives
- Maintenance & Inspections
- Advanced treatment systems
- Cluster treatment systems



# Erosion Prevention and Sediment Control



Cal Sawyer

Clemson University

# Presentation Outline



- Erosion and Sedimentation 101
- Regulatory Background
- EPSC Practices
  - Runoff Measures
  - Erosion Prevention
  - Sediment Control
- Inspection and Maintenance
- The Good, the Bad and the Ugly



# Sediment



## ■ Natural erosion:

- Also referred to as geologic erosion -- is relatively slow
- Most rapid along shorelines and stream channel
- Vital factor in maintaining environmental balance
- Produces about 30% of all sediment in U.S.

## ■ Accelerated erosion:

- Refers to erosion occurring at increased rate usually because of removal of natural vegetation or alteration of ground contour
- Accounts for 70% of all sediment generated in U.S.
- Construction and agriculture are main causes.

# Sediment



## ■ Adverse impacts:

- Screens out sunlight/ reduces clarity
- Fills channels and reduces capacity
  - sediments can fill up ponds and reservoirs
  - sedimentation can plug culverts and storm drains
- Pollutants attach to sediment particles
  - legal action
  - additional costs and penalties
  - delays in schedule
- Property damage from flooding



# NPDES Storm Water Program

## ■ Point Source Pollution

- Discharges from manufacturing facility pipe or some other readily identifiable source.



## ■ Nonpoint Source Pollution

- Discharges that are less easily identifiable such as runoff from urbanized areas, agricultural areas and construction sites.



# Construction BMPs

- Runoff Measures



- Erosion Prevention



- Sediment Control



# Inspection and Maintenance



# Site Inspections

- Represent link between approved plans and implementation
- Required for compliance with NPDES permit
- Only way to stay informed of a site's condition
- Can reduce liability of site if practices are proven to be installed and maintained properly
- Important for record keeping



# Inspection Reports

1. The inspection date
2. Name, title and qualifications of inspector
3. Weather information since last inspection
4. Description of any discharges occurring
5. Locations of discharges of sediment or other pollutants from the site





# BMP Maintenance

- These practices all require varying degrees of maintenance
- Critical to effective operation
- Requirements vary with practice
  - Sediment traps and rock ditch checks when sediment depth reaches  $\frac{1}{2}$  design volume
  - Silt fence, fabric drop inlet protection, etc at  $\frac{1}{3}$  design height



# Bottom Line...

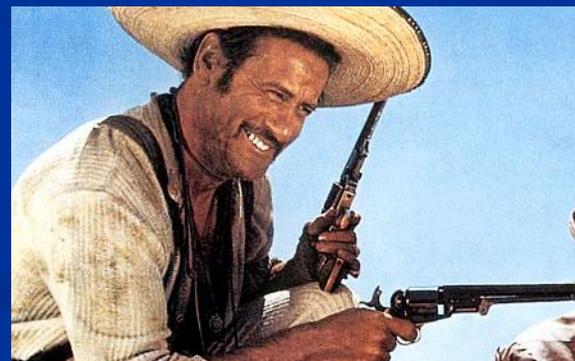
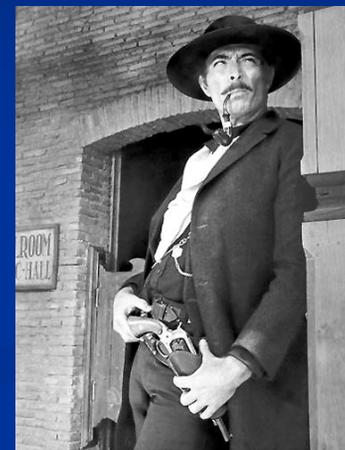
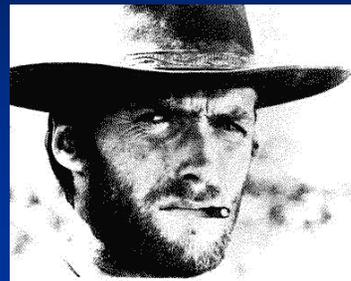
- Properly designed and installed practices are **NOT** enough...
- Good site inspection and BMP maintenance programs are essential to avoid off site impacts



# The Good, The Bad and The Ugly

## ■ BMP Examples

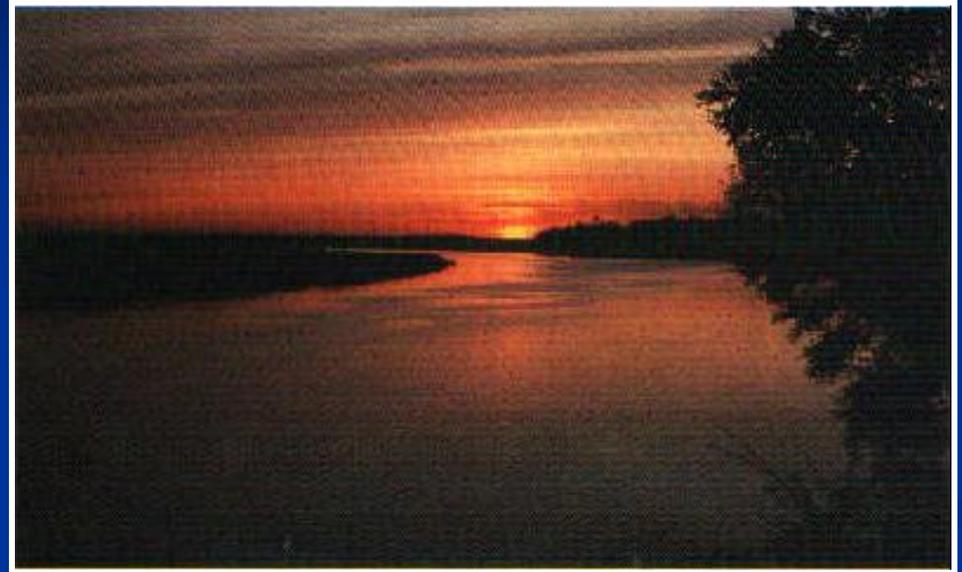
- Proper installation and well-functioning
- Practices in need of maintenance
- Practices in poor condition or failing











# ***Extending Water Quality and Conservation Ideas to Elected and Appointed Officials***

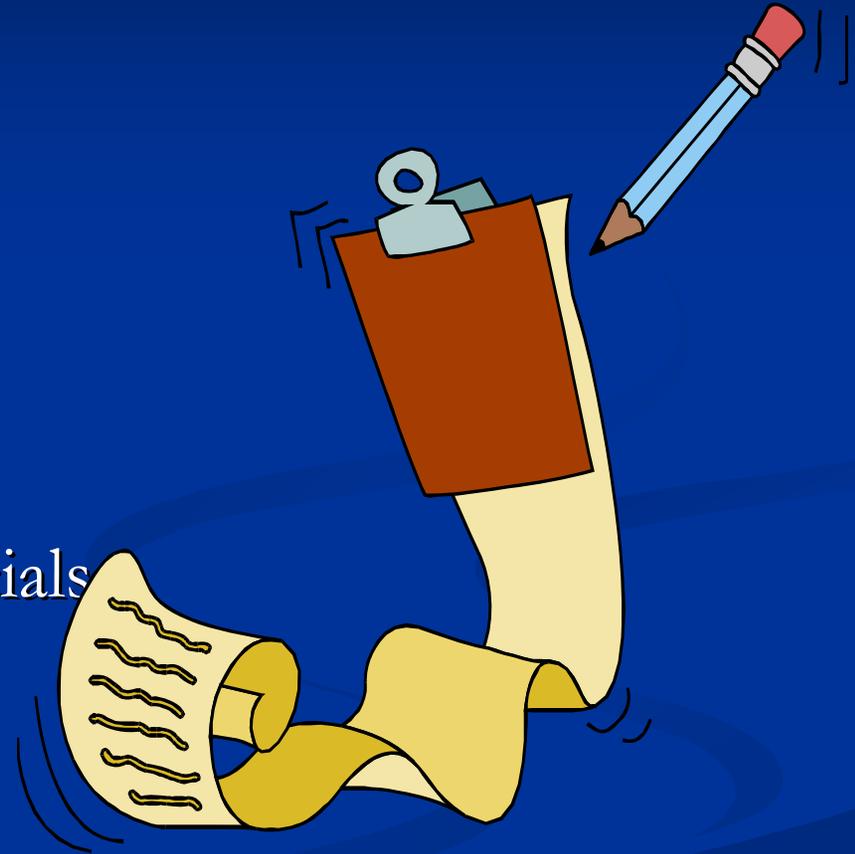
*Cal Sawyer  
Clemson University*

# Excited????

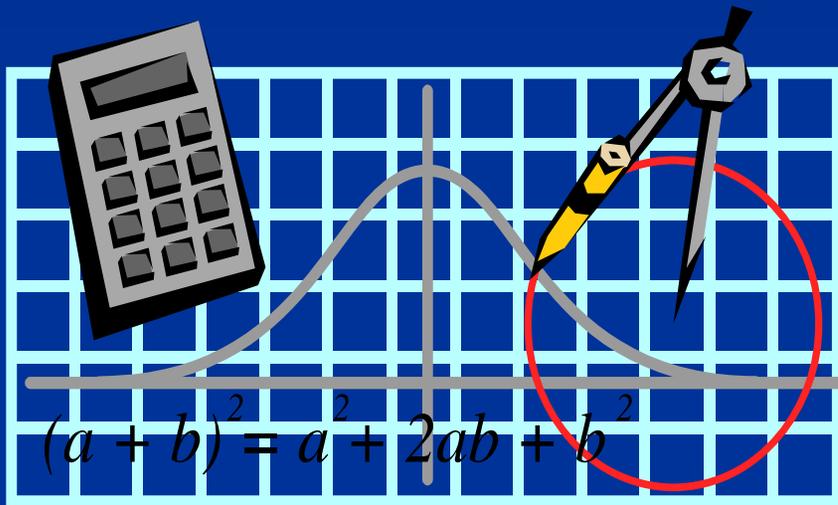


# Presentation Overview

- Working with Local Officials
  - Tough audience
  - Various approaches
  - Logistical tips
- Case Study - SC Nonpoint Education for Municipal Officials
  - Program overview
  - Our strategy
    - Comprehensive planning
    - Site design



# Facts About Local Officials



- Complex issues
- Politically motivated

# Reaching Local Officials



- Focus on rational decisions
- Present information in context of responsibilities
- Watch informational material overload

# Logistical Tips

- Use local data and information
- Use humor...they need every bit they can get!
- Use latest technology





***Nonpoint  
Education  
for Municipal  
Officials***

***Linking Land Use to Water  
Quality in South Carolina***

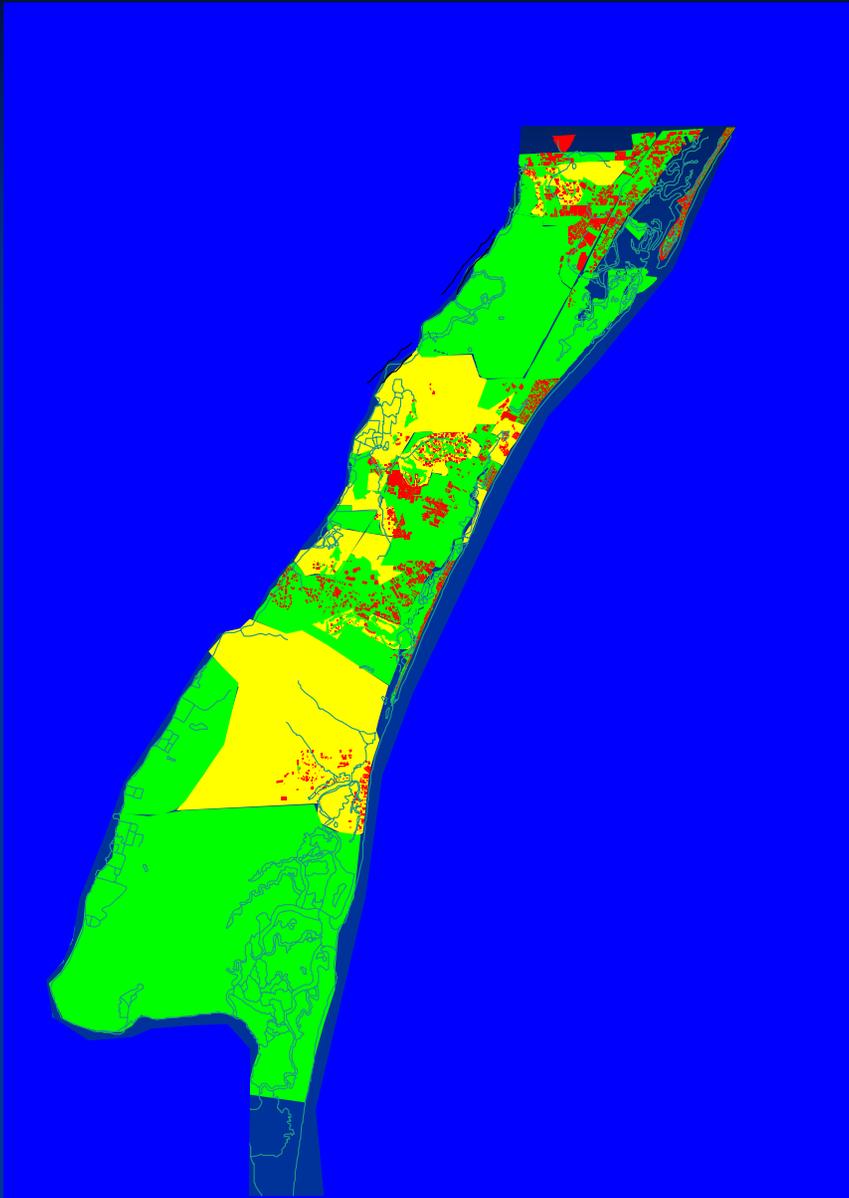


**INTENSITY OF LAND USE**

**AMOUNT OF IMPERVIOUS SURFACE**

**POTENTIAL WATER QUALITY PROBLEMS**

## CURRENT LEVELS OF IMPERVIOUS COVER BY LOCAL WATERSHED



### PERCENT IMPERVIOUS



**Degraded (> 25%)**



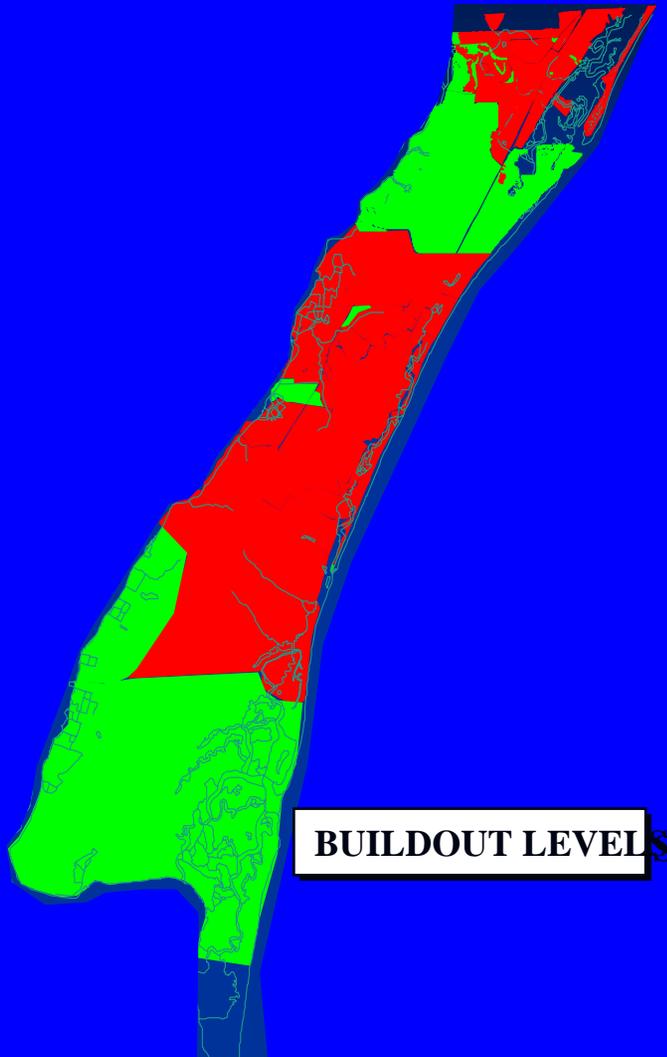
**Impacted (10 to 24.9%)**



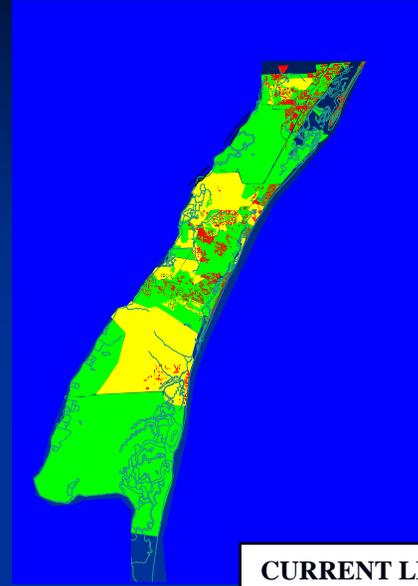
**Protected (0 to 9.9%)**



# PROJECTED LEVELS OF IMPERVIOUS COVER BY LOCAL WATERSHED



**BUILDOUT LEVELS**



**CURRENT LEVELS**

**PERCENT IMPERVIOUS**

-  Degraded (> 25%)
-  Impacted (10 to 24.9%)
-  Protected (0 to 9.9%)



**WACCAMAW NECK**

# Cost Factors



Traditional Drainage \$150 - \$250 per linear foot

Engineered Swales \$10 - \$25 per linear foot



- ~~Curbing~~
- ~~Catch basins~~
- ~~Piping~~
- ~~Outlet Structure~~
- ~~Detention/Retention Ponds~~

Don't forget, Maintenance Includes:

Inspection

Sediment/debris removal

Structural repairs

Who will Maintain?

# Building and Working with Stakeholder Groups



Eve Brantley

Alabama Cooperative Extension System

# Why Involve the Public?

- Learn alternative viewpoints on issues
- A good source of ideas
- Gain support for projects or issues
- They need to be a part of decisions that may impact their quality of life, business, or future plans



***Bring 'em to the table now and they're your friends ... exclude them and they're your enemies***

# Stakeholder analysis worksheet

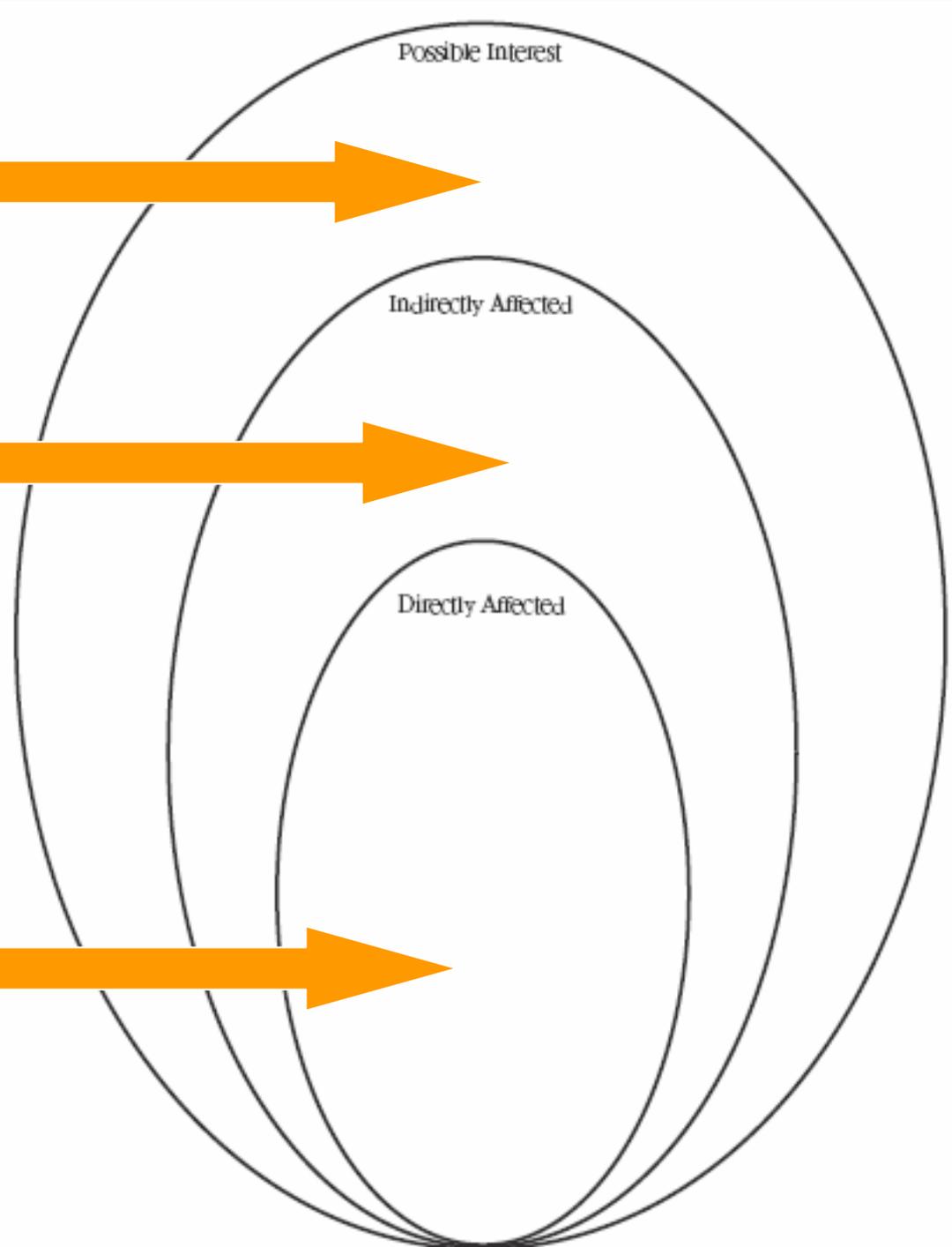
- Questions that can help answer who you need to target ...
  - Who caused the problem?
  - Who in the community is affected (directly or indirectly)?
  - Who cares?



**This used to be a pretty crick.**

**I don't catch as many fish as I used to.**

**I'm losing my backyard to the stream.**



# Keys to Successful Outreach

- K.I.S.S. - Technology Transfer
  - Use terms that your grandmother can understand.
  - Package information in a friendly manner.



# Get the Word Out

- Media campaign, public service announcements
- Attend community meetings, make presentations
- Hold meetings on a regular schedule
- Create web site
- Distribute a non-technical newsletter
- Produce technical documents that address specific concerns



# Watershed Funding Sources and Strategies



Eve Brantley  
Alabama Cooperative Extension  
System



MAY 1 2003

# EPA Office of Wetlands, Oceans, & Watersheds

## www.epa.gov/owow

fpub.epa.gov/fedfund/



**U.S. Environmental Protection Agency**

### Watershed Academy

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## Catalog of Federal Funding Sources for Watershed Protection

The Catalog of Federal Funding Sources for Watershed Protection Web site is a searchable database of financial assistance sources (grants, loans, cost-sharing) available to fund a variety of watershed protection projects. To select funding programs for particular requirements, use either of two searches below. One is based on subject matter criteria, and the other is based on words in the title of the funding program.

Criteria searches include the type of organization (e.g., non-profit groups, private landowner, state, business), type of assistance sought (grants or loans), and keywords (e.g., agriculture, wildlife habitat).

Searches result in a listing of programs by name. Click on each program name to review detailed information on the funding source.

**1** **Type of Assistance:**  Grants Loans

**2** **Eligible:**  Business

# FedGrants

<http://www.fedgrants.gov/>

## Federal Grant Opportunities

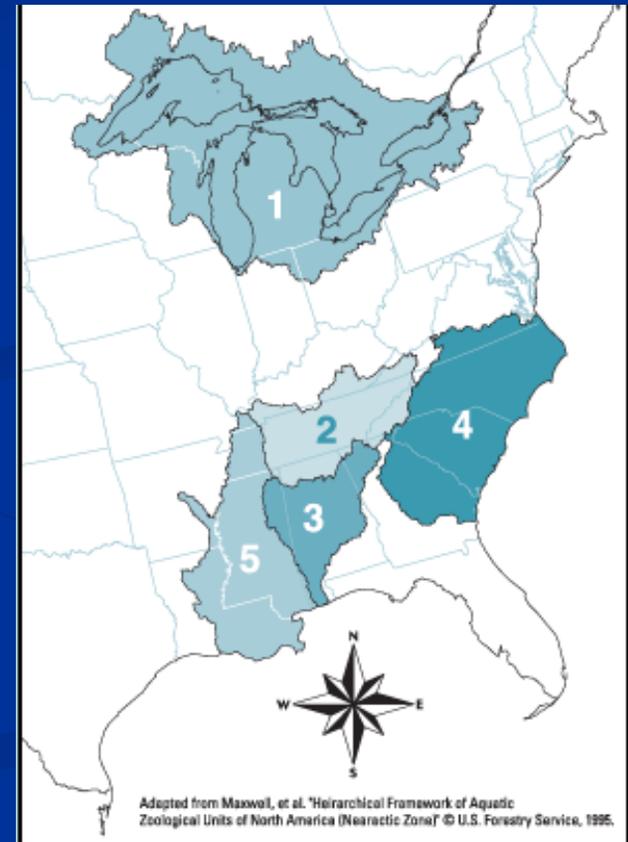


[Grantor](#) | [Applicant](#)

This site gives grantors a means to post solicitations for grants. It also gives applicants a single site for obtaining these solicitations.

For support or questions, please contact FedGrants support at [support@grants.gov](mailto:support@grants.gov) or call the FedGrants Help Desk at 1-800-518-4726

- **Conservation of Freshwater Ecosystems in North America**
  - Focuses on the Great Lakes region and portions of the southeastern United States.
  - The Great Lakes contain 20 percent of the world's fresh water supply.
  - *Freshwater ecosystems within the Southeast have among the highest levels of species diversity in the world.*



# Group Suggestions

- What are other funding sources you have acquired?
- What are the major stumbling blocks to implementing watershed projects ...
  - Funding?
  - Technical Expertise?
  - Landowner Cooperation?



Join us for the next Watershed Academy –

March 28 -30, 2006

Hosted by University of Georgia

[www.aces.edu/waterquality](http://www.aces.edu/waterquality)

