

Upland Management: Protecting Water Quality Before The Pond



Kimberly Counts
Water Resources Extension Agent
Clemson Extension Service
Carolina Clear Program



What Every Resident Should Know About Stormwater Ponds



Stormwater Ponds provide critical services:

-SW Ponds **prevent flooding** by suppressing surges of stormwater runoff from houses, driveways, cars, etc

-SW Ponds **protect water quality** by holding water long enough to allow gravity and other processes to remove sediment and pollutants from the water before it is discharged to nearby waterways or beaches.

Common Problems and Their Causes



Muddy Ponds

Potential Causes:

- Unstable pond banks scoured by wave energy
- Exposed soils in the community and along pond edges
- Biological factors such as fish, turtles, and waterfowl



Potential Solutions:

- Stabilize banks with vegetation
- Establish grass and vegetation in yards to prevent erosion
- If remains muddy, filtration system or additive may be needed

Surface Films and Sheens

Potential Causes:

- Pollen and atmospheric dust
- Blue-green algae
- **Hydrocarbons and oils**
- Insoluble compounds in the soil

Potential Solutions

- Biological Sources (pollen or algae) typically biodegrades in a few weeks time
- **Identify and eliminate source of oil**
- Eliminate source of muddy water by stabilizing banks



Shoreline Erosion

Potential Causes:

- Pond banks with grass mowed to the edge
- Fountains
- Nuisance wildlife



Potential Solutions

- Stabilize shoreline with emergent wetland plants or artificial material
- Move fountains to center of pond or consider replacing fountain with other type of circulation system
- Stop feeding ducks and geese



Note: Establishing wetland plants is the preferred method for stabilizing pond banks, due to the many benefits beyond erosion prevention

Foam

Potential Causes:

- Illicit discharges of soap and detergents
- Naturally, typically associated with algal blooms



Potential Solutions

- Identify and reduce source of soap and detergents



Polluted water

Potential Causes:

- Fertilizing lawns
- Pet waste
- Washing cars
- Automotive maintenance
- Pesticides
- Feeding wildlife



Potential Solutions:

Sources of pollution are best minimized by educating the community about the effects of stormwater pollution (EPA)



Non-Structural Best Management Practices

Combatting Common Threats to Water Quality



Irrigation Practices

Over-watering can encourage weed growth and plant disease, lead to increased stormwater runoff.

- Irrigate lawns early in the morning for efficient water use and to discourage the spread of disease.
- Never irrigate on impervious surfaces
- Learn to recognize signs of stress (Ex. Crunching)
- Track Rainfall-Install a Rain Gauge!



Be Wise When You Fertilize

- Test soil before applying fertilizer
- Never apply fertilizer on impervious surfaces
- Always follow the label, the “Label is the Law!”
- Look for 0 to low Phosphorus fertilizer
- Always store properly

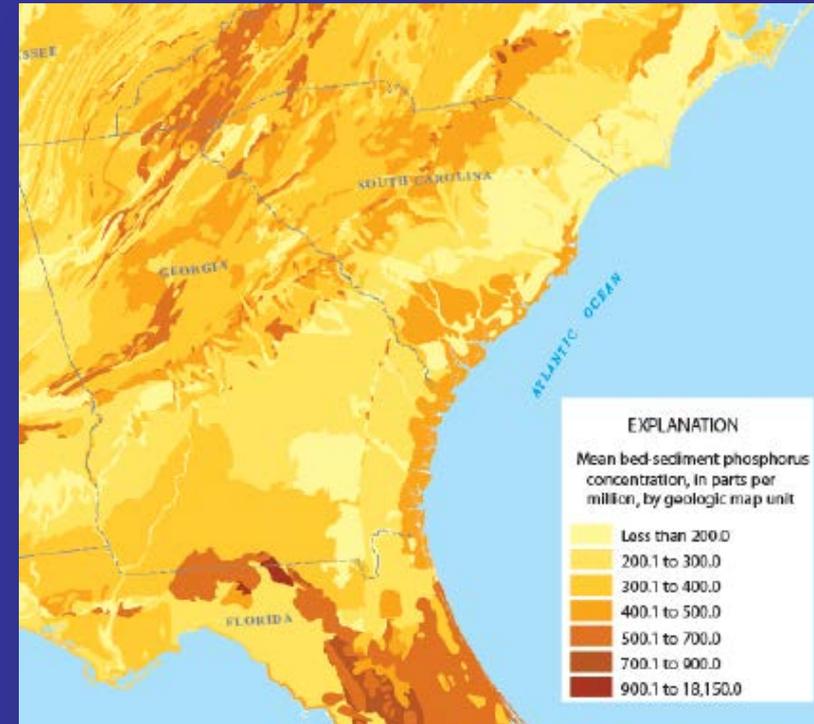


Scotts drops phosphorus from lawn fertilizer

Marysville company acts to reduce risk of runoff feeding toxic-algae blooms in lakes; competitors likely to follow its lead



Source: USGS NAQWA Program



Pet Waste Management



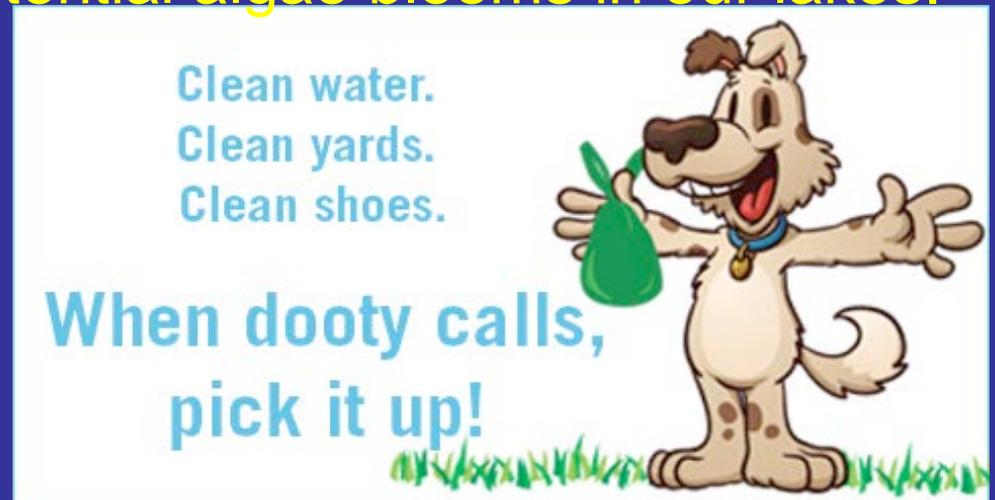
Install a pet waste station in your community space!

What's the Problem?

- Pet waste contains bacteria that can be harmful to human health
 - *2.5X's that of humans
 - *10,000 lbs in Charleston Area a day

–SCDHEC

- Nutrients in the waste also add to potential algae blooms in our lakes.



No Spray/No Mow Zones Along Freshwater Shorelines

Lawn should be kept at the maximum recommended height for the specific turf

- allow for a more extensive root system
- help stabilize soil
- larger leaf area, which can work to slow runoff, and capture sediment

Avoid use of fertilizers and pesticides along shorelines

- use right plant for right place
- hand pull weeds
- plant closely to outcompete weeds



Structural Best Management Practices

- Rain barrels/cisterns
- Rain gardens
- Porous materials
- Vegetative buffers
- Use of Native Plants

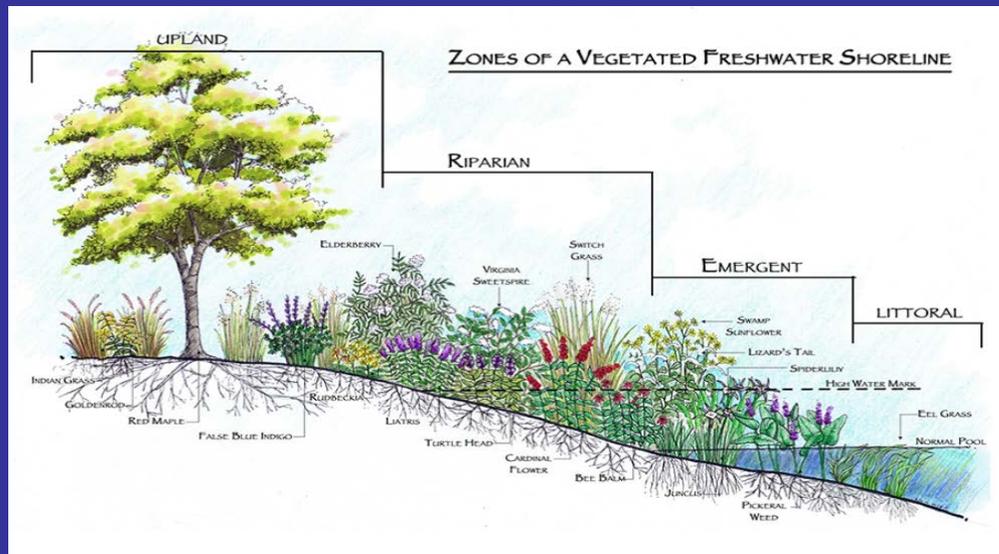


Vegetative Buffers

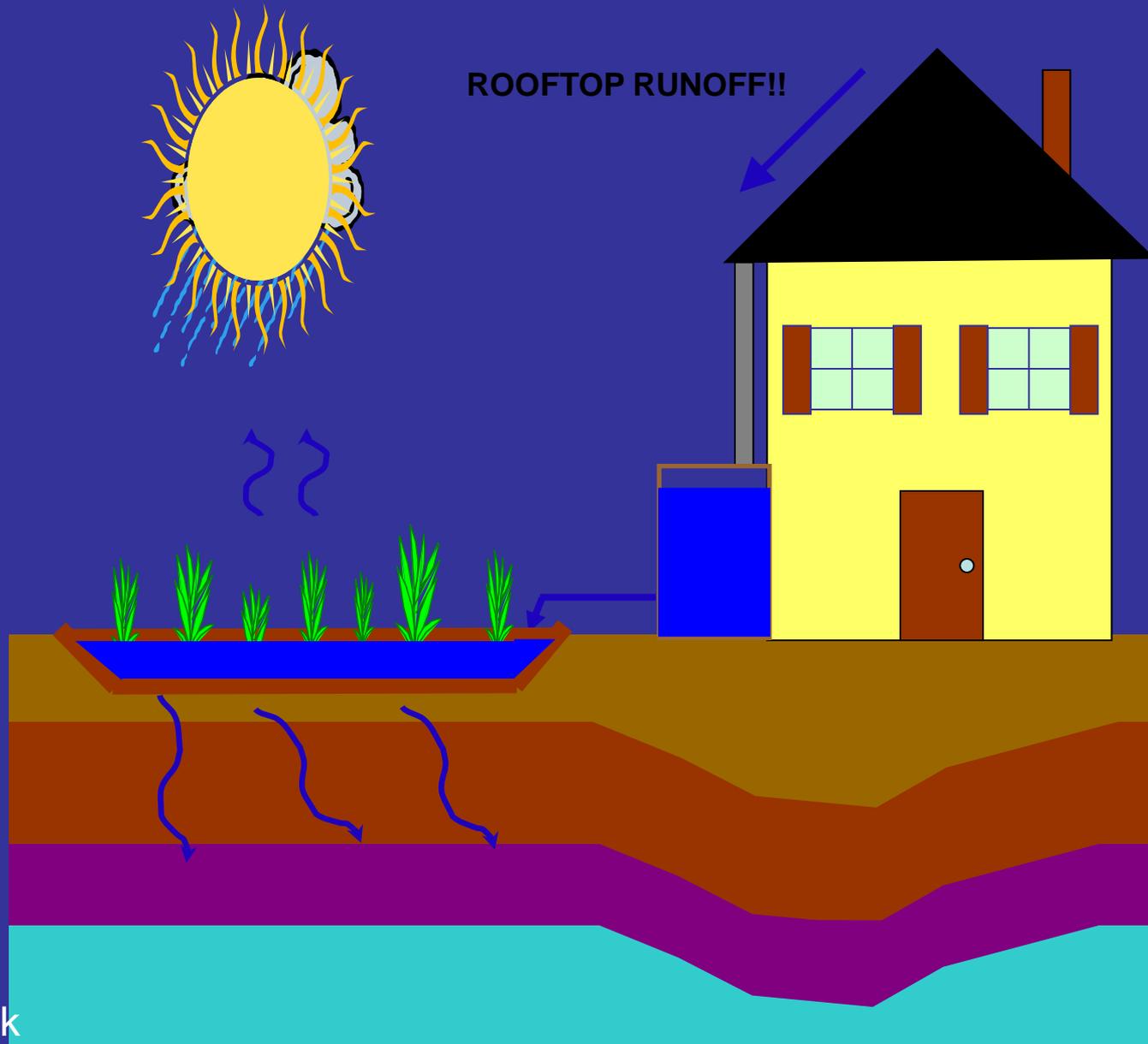
A shorescape is a landscaped shoreline that uses attractive plants to protect and beautify the waterfront

- Wildlife Management
- Combat Invasive Weeds
- Protect Water Quality
- Stabilize Shorelines
- Can be an attractive feature

*Important to consider balance of function and aesthetics



Rainwater Harvesting – Barrels and Gardens



Slide by: Dr.
Daniel Hitchcock

Porous Materials

Incorporate permeable walkways, driveways and paths.



- Porous Asphalt
- Pervious Concrete
- Interlocking Pavers
- Gravel Paths
- Mulched Paths

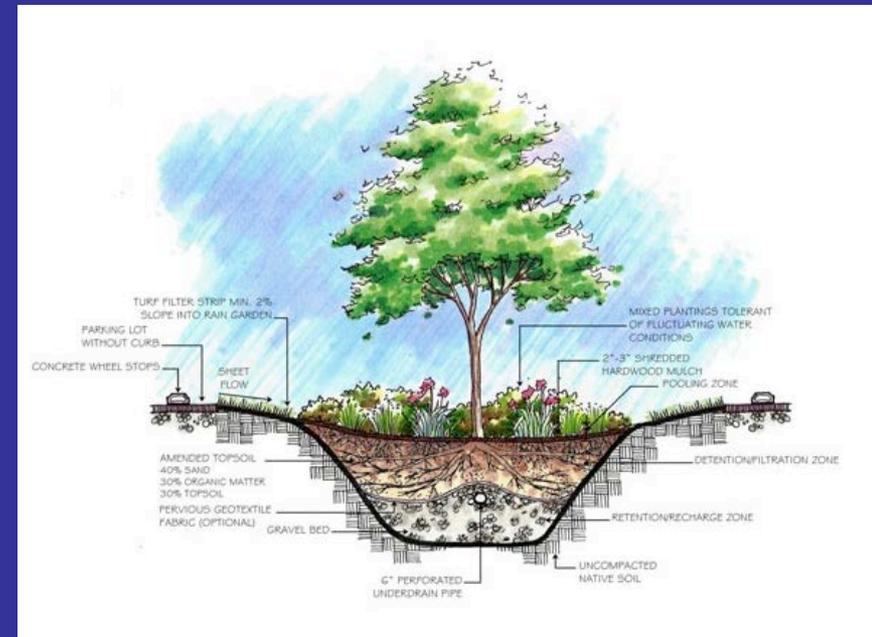
Benefits & Considerations of Porous Materials

- Volume Reduction
- Flood Control
- Water Quality
- Heat Island Mitigation
- Compliance



Residential Rain Gardens

- Appealing landscape ideas for homeowners and HOAs
- Allows collection of stormwater and infiltration
- Plants and microbes do the work of pollutant removal
- Can be attractor for wildlife such as birds and butterflies
- A smart way to irrigate



The Effectiveness of a Rain Garden in Removing Pollutants

Pollutant	Sources	% Removal
Cooper	Shingles, oil, grease, soil	43-97%
Lead	Shingles, oil, grease, soil	70-95%
Zinc	Shingles, oil, grease, soil	64-95%
Phosphorus	Detergents, fertilizers, pet waste	65-87%
Total Nitrogen	Fertilizer, pet waste, organic matter	49-67%
Calcium	Fertilizer	27%

Source: U.S. EPA

[Rain Gardening in the South](#)

Location Considerations

- > 10 ft. from building foundation
- > 25 ft. from septic system drain field
- Avoid shallow water tables < 18 in. deep
- Away from utility lines
- Perk Test
- In full to partial sun, if possible



Rooftop

Rooftop Drainage Area = 25 ft. x 25 ft.
625 sq. ft.
Required Rain Garden Area @ 20% =
125 sq. ft.

25 ft.

25 ft.

Downspout

Corrugated pipe
(buried, if needed)

8 ft.

17 ft.

- Determine the area of impervious runoff source (rooftops + sidewalks + driveway areas)
- Rule of thumb: estimate the size of your rain garden based on soil types:

Sandy soil (well-drained)
= 20% of impervious area

Loamy soil (poorly-drained)
= 20-60% of impervious area

Rain Garden Sizing

Native Plant Landscaping :

- Sense of Place
- Combat Invasive Plant Species
- Support Biodiversity
- Require Little to No Fertilizer/Irrigation
- They are Hardy & Pretty at the same time!



Perennials



Blazing Star
Liatris spicata



Narrowleaf Sunflower
Helianthus angustifolius

Purple Coneflower
Echinacea purpurea



Stokes Aster
Stokesia laevis



Blanket Flower
Gallardia pulchella

Shrubs



Oakleaf Hydrangea
Hydrangia quercifolia

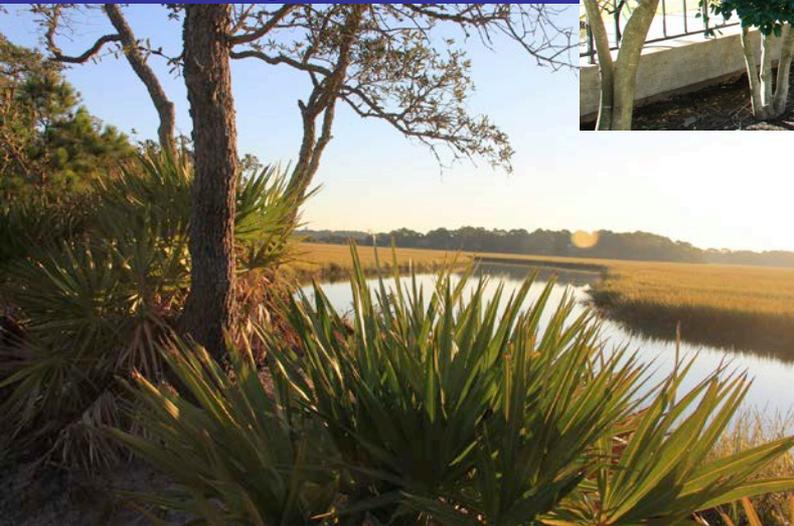


American Beautyberry
Callicarpa americana



Coastal Azelea
Rhododendron atlanticum

Saw Palmetto
Serenoa repens



American Holly
Ilex opaca



Support Biodiversity

- Native Insect fauna largely depend on native plant species for food
- Insect populations in areas with many alien plants will be smaller
- Many animals depend partially or entirely on insect protein for food
- A land without insects is a land without most forms of higher life (Wilson 1987)
- Example: Neotropical migrants are declining by 1% a year since 1996 due to habitat loss and invasive species (Sauer, Hines, & Fallon 2005)



Most terrestrial bird species rely on insects to feed their young (300 caterpillars/day)

“Reconciliation Ecology”

-Michael Rosenzweig
2003

Redesign of human habitats in order to accommodate other species.

Even if nature is not pristine, does not mean we must give up on nature all together.

Gardeners play a central role by using native plants in their home landscapes



Residential Rainwater Harvesting



Why Harvest Rainwater?

- **Economics—Rain is a FREE resource**
- **Supply: In Coastal SC, Significant Annual Rainfall**
- **Reduces Demand on Potable Water Supply and Groundwater**
- **Improve flood/erosion prone areas of your landscape**
- **Many plants thrive on this pH neutral source of water**
- **Conserve & Protect Water Quality**



The better question is why aren't more people harvesting rain water?

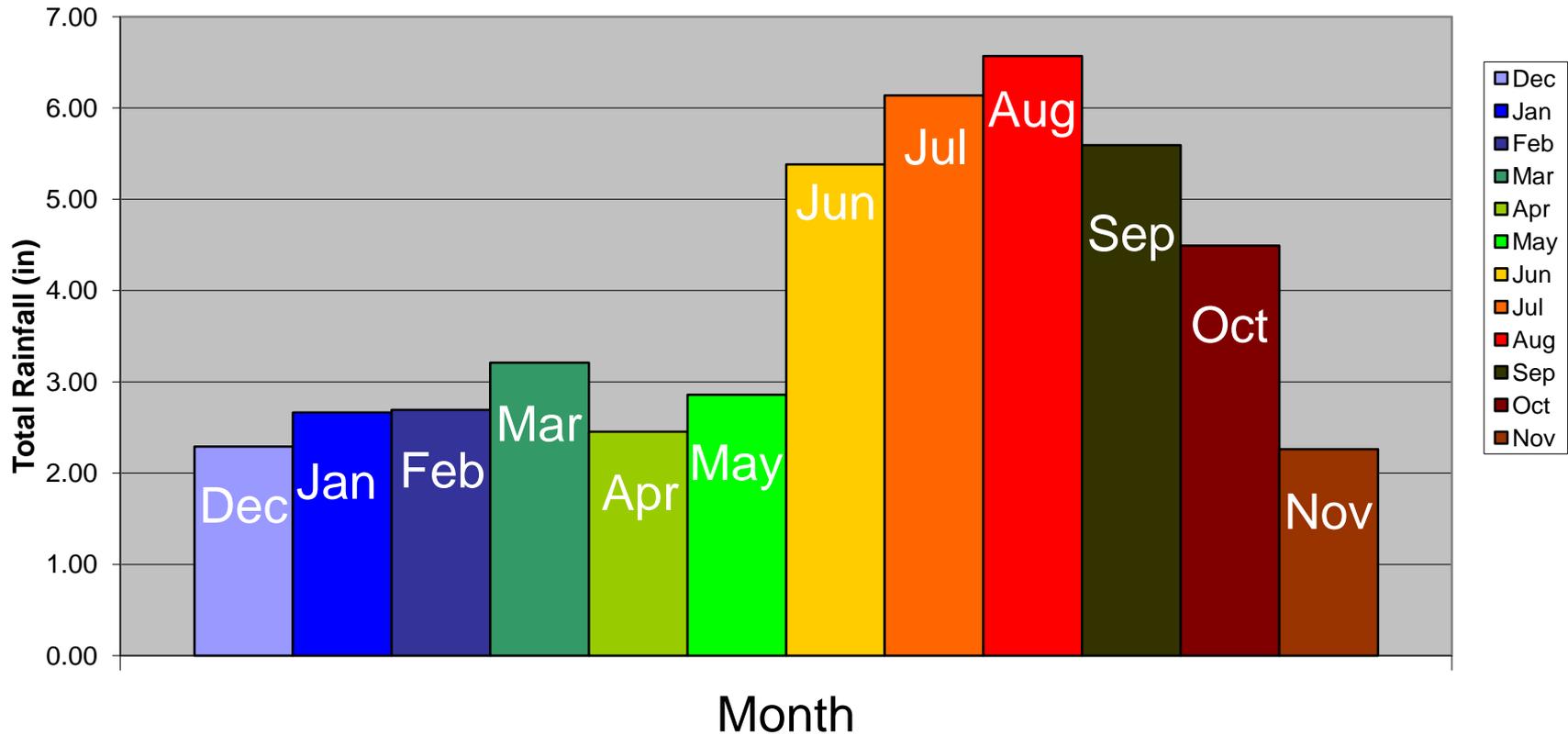
Rainwater Harvesting Comes in All Shapes & Sizes!

Rain Barrel vs. Cistern



SUPPLY-Charleston Area Rainfall Patterns

Average Total Rainfall per Month from Charleston International Airport 1999-2008



How much rainwater can you harvest?

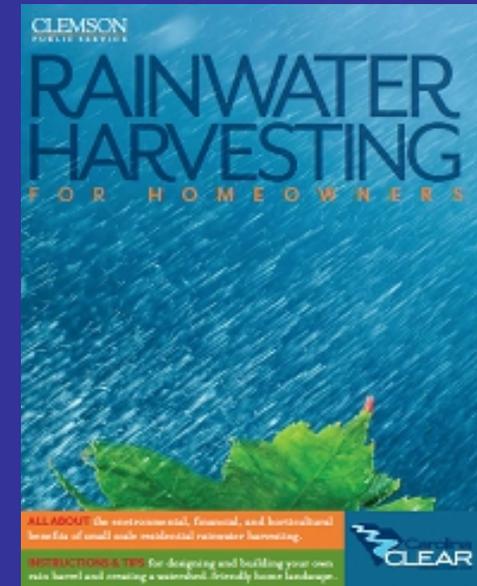
$$\begin{array}{l} \text{Supply} \\ \text{(gallons)} \end{array} = \begin{array}{l} \text{Rainfall} \\ \text{(inches)} \end{array} \times \begin{array}{l} \text{Roof Area} \\ \text{(sq. ft.)} \end{array} \times 0.623$$

Example: In Charleston Annual Potential of Rainwater Harvested

$$\begin{array}{l} 50 \text{ inches} \\ \text{of rainfall} \end{array} \times \begin{array}{l} 1000 \text{ sq.} \\ \text{ft. roof area} \end{array} \times 0.623 = > 30,000 \text{ gallons!!!}$$

What to Look For When Purchasing a Barrel?

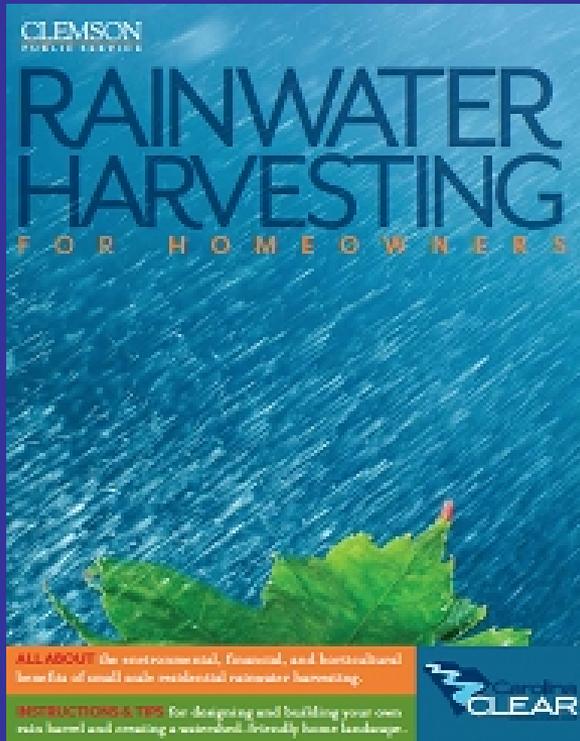
- Outlets that can be turned on and off
- Emergency overflows that allow water to escape when barrel is full (direct away from house)
- Dark colored that prevents sunlight penetration and algae growth
- Recycled barrels, should be food grade never been used to transport chemicals
- Point of water entry secure to exclude small animals/children
- Screening to prevent mosquitoes



And Remember, Use the Water You Capture!



Check out the Carolina Clear website to download these resources for Free!



www.clemson.edu/public/carolinaclear/

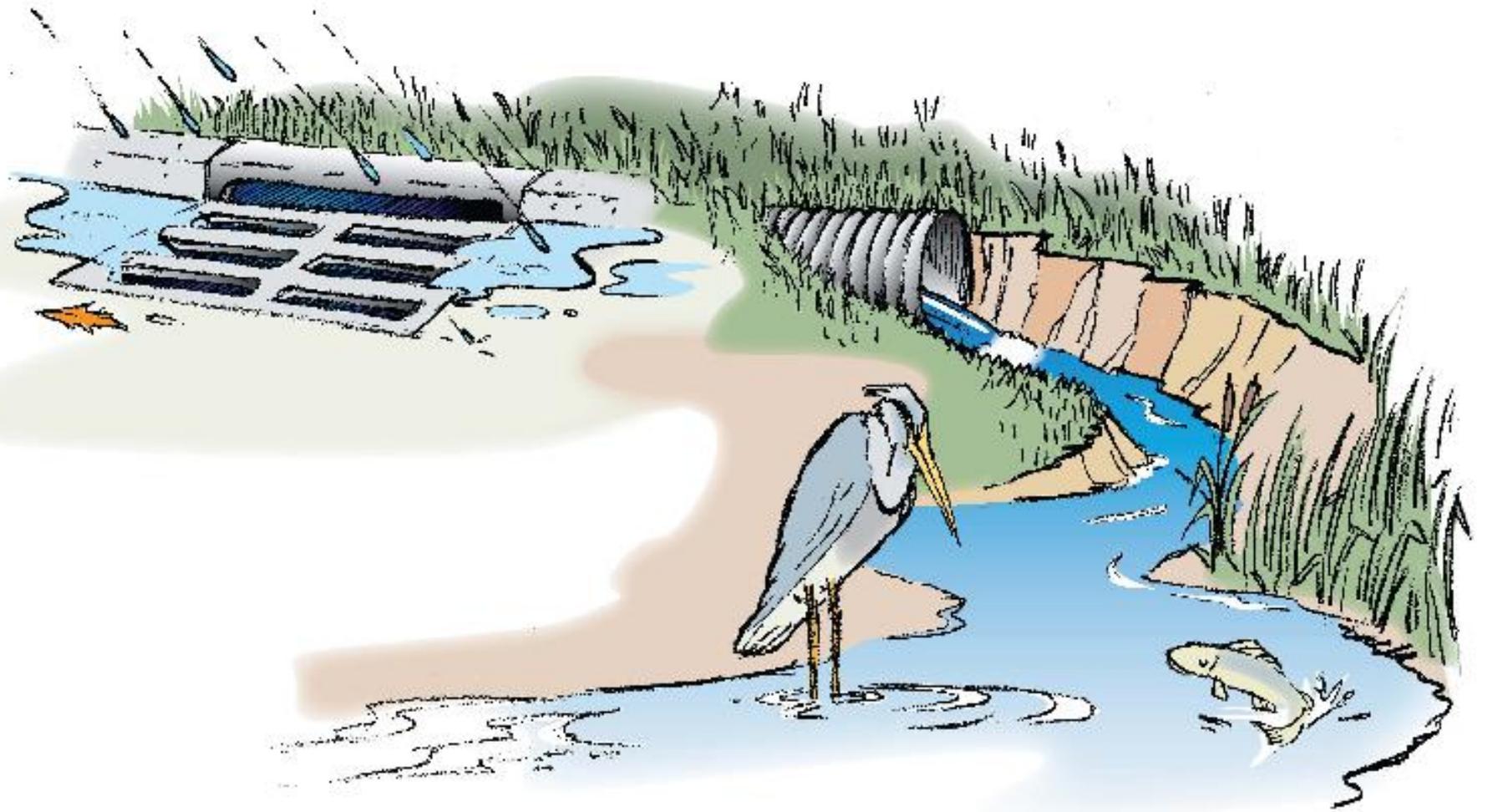
Thank You!



Kimberly Counts
Water Resources
Extension Agent
Clemson Carolina Clear
kcunts@clemson.edu
843-722-5940 Ext 128

Special Thanks To:

Rain Garden and Rainwater Harvesting Slides adapted from:
Dr. Dan Hitchcock; Baruch Institute of Coastal Ecology and Forest Science



Vegetative Buffers

Riparian buffers are a width of vegetation along the shoreline of a waterbody that stops or slows runoff; plants uptake excess nutrients and trap sediments; bacteria can be destroyed through natural processes; water can infiltrate to the groundwater, slowing the rush of runoff to waterways. Healthy riparian buffers can be as minimal as 8 feet wide to remove sediment to more than 30 feet wide to remove nitrogen from affecting waterways. Buffers can also stabilize the shoreline and prevent loss of property and sediment being added to the lake or river.

For Recommendations on balance of function and aesthetics,
SC Waterways Factsheet in your participant binder

