Green Solutions to Pollution: Rainwater Harvesting

Town of Bluffton Municipal Complex
October 1, 2008

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Water Quantity and Quality

QUANTITY:

- Flood control
- Conveyance
- Storage
- Salt water intrusion
- Sea level rise

QUALITY:

- Harmful bacteria and viruses
- Nuisance algal blooms
- Low dissolved oxygen (DO)
- Fish kills
- Sediment and chemicals
- Invasive species
- Downstream ecological health

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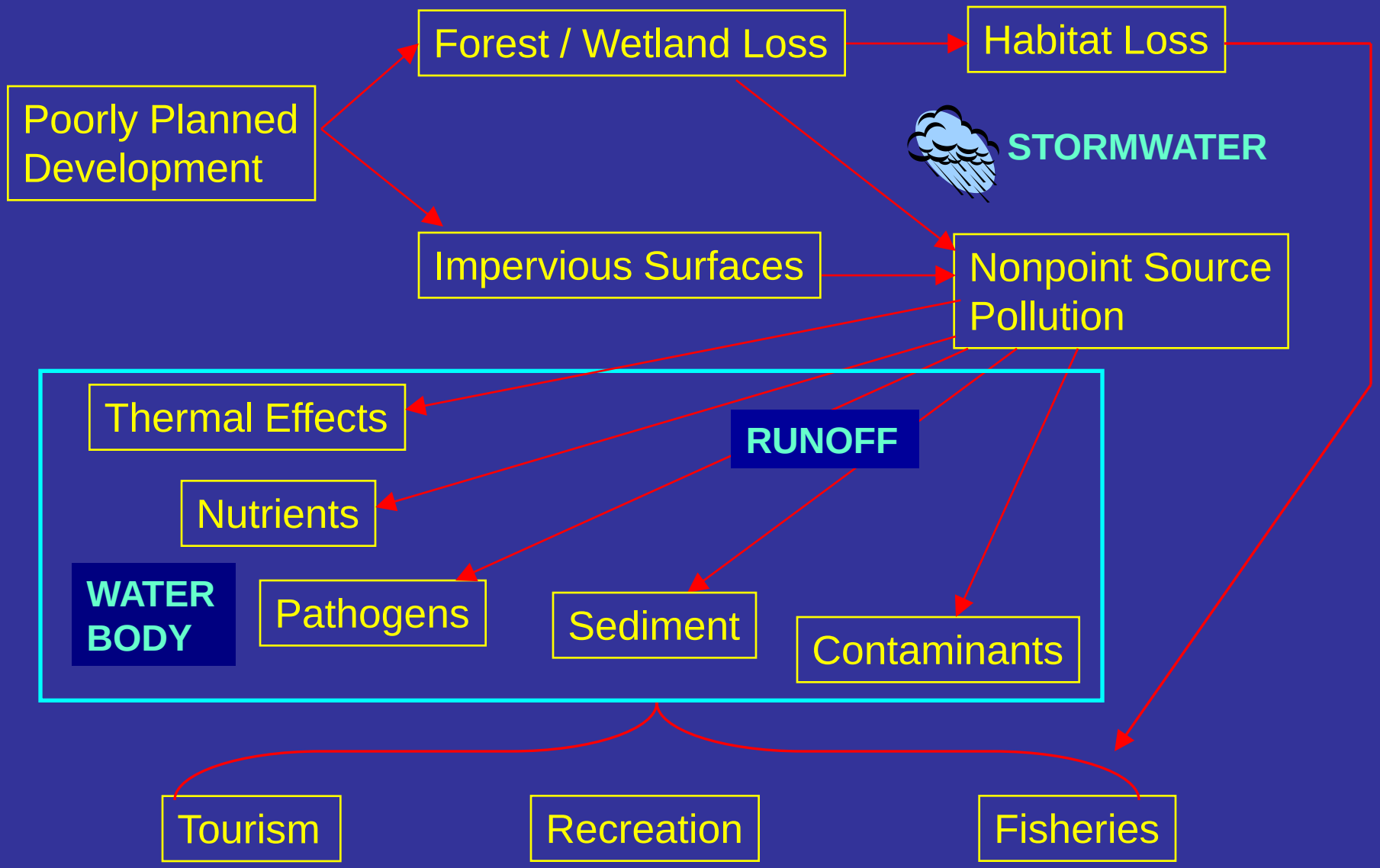
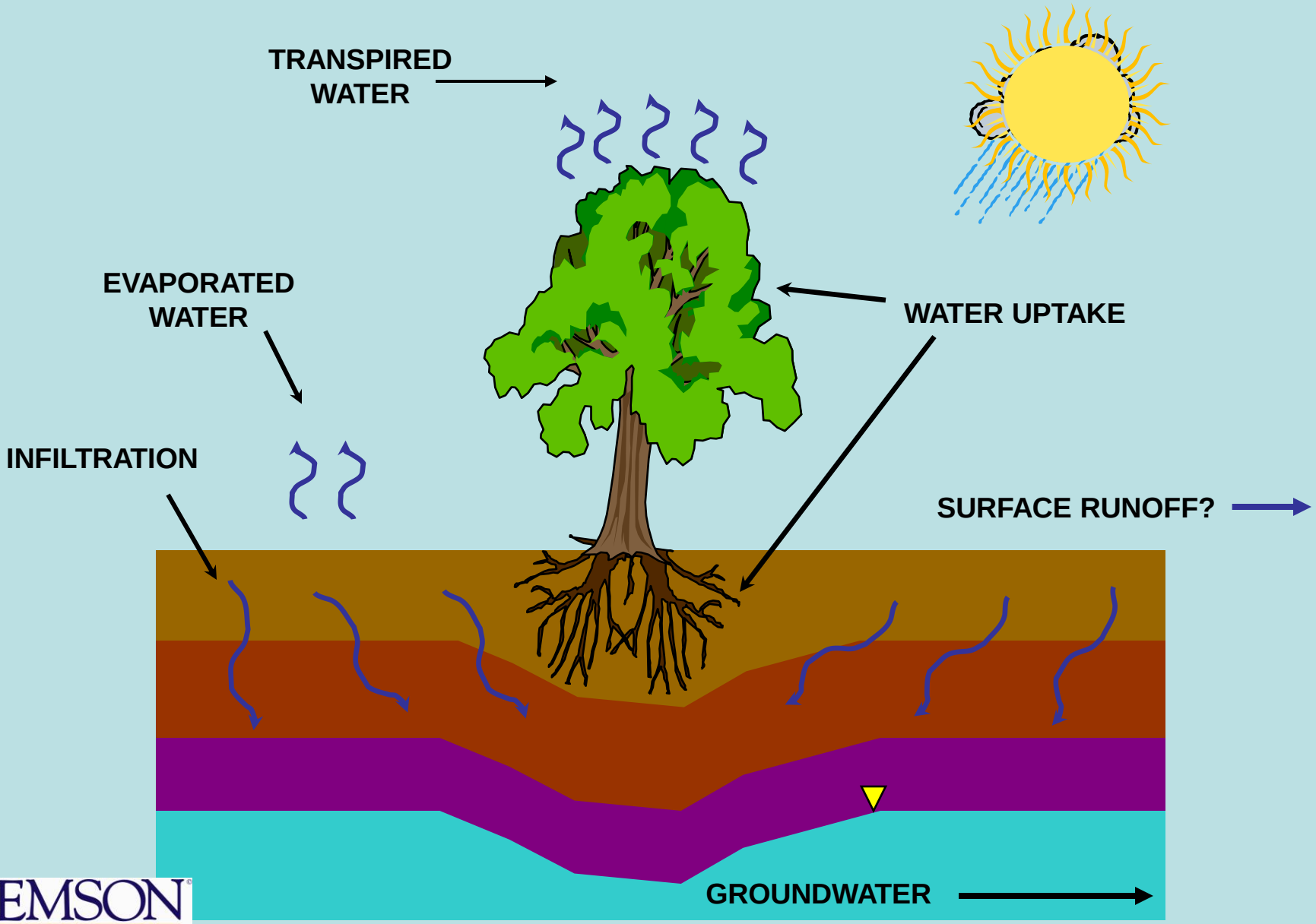
Linking Land Use and Water Resources: A Cause and Effect Relationship



Forest Water Budget – Typical Scenario



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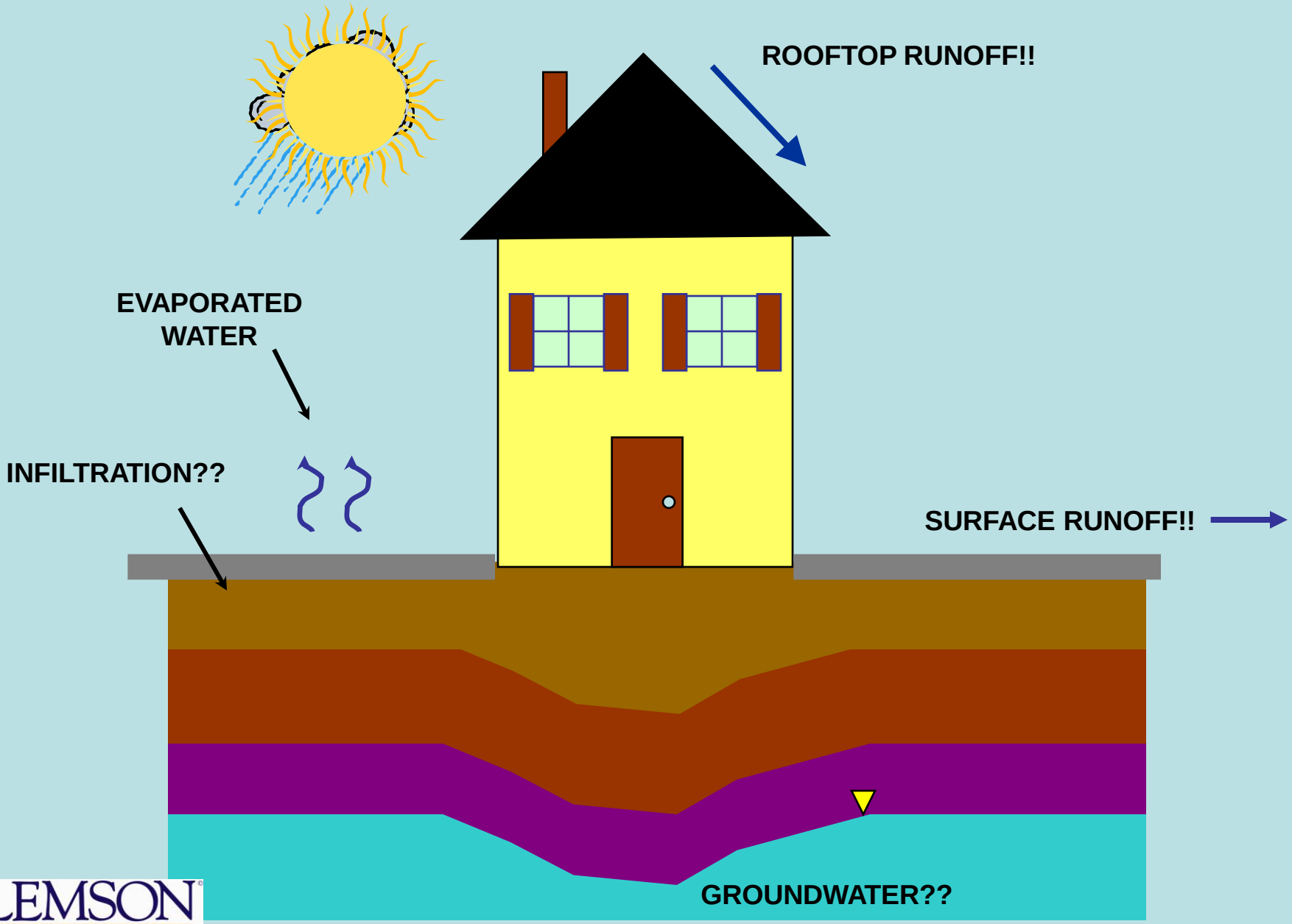
Urban Water Budget – Pavement and Rooftop Scenario



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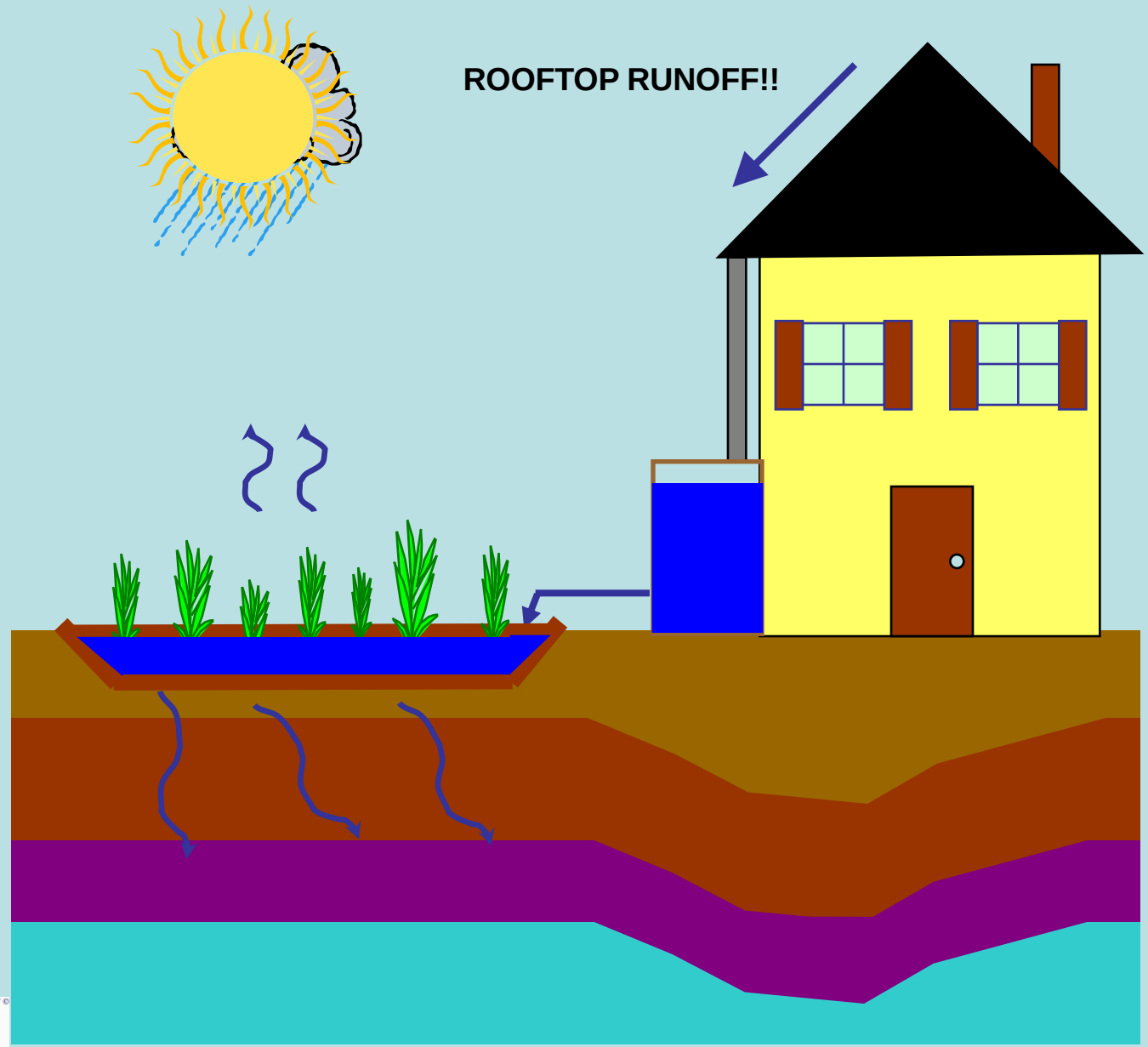
Urban Water Budget – Rainwater Harvesting Scenario



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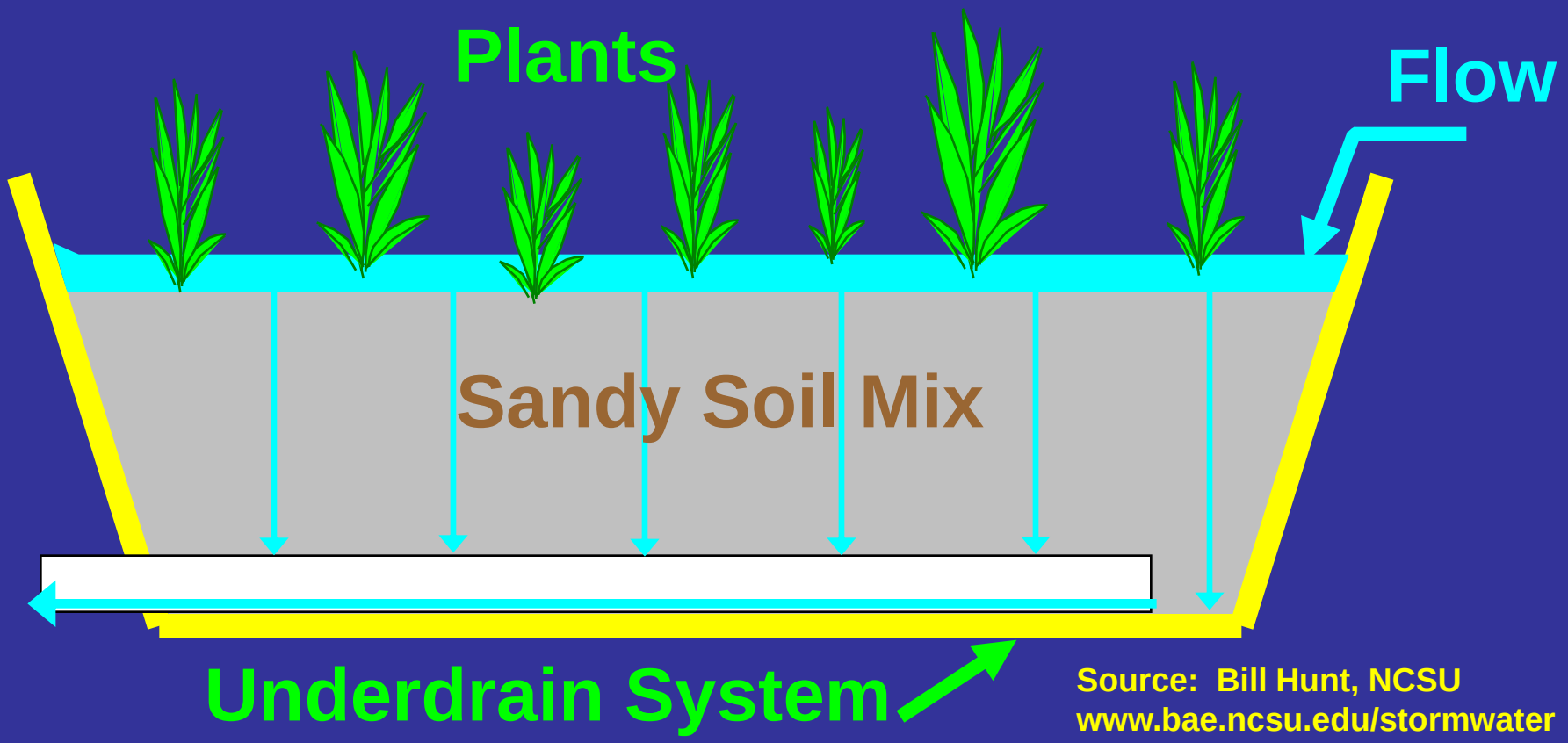
How does a rain garden work?



Source: Bill Hunt, NCSU
www.bae.ncsu.edu/stormwater

Rain gardens –an attractive idea…

- 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 natural way to irrigate

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Where do we put the rain garden?

- Between rainfall runoff "*source*" and "*destination*"

- We want to *intercept* the water before it reaches surface waters or low spots!

Photo: NC State

- *Gutters* and *downspouts* help direct rooftop runoff flow

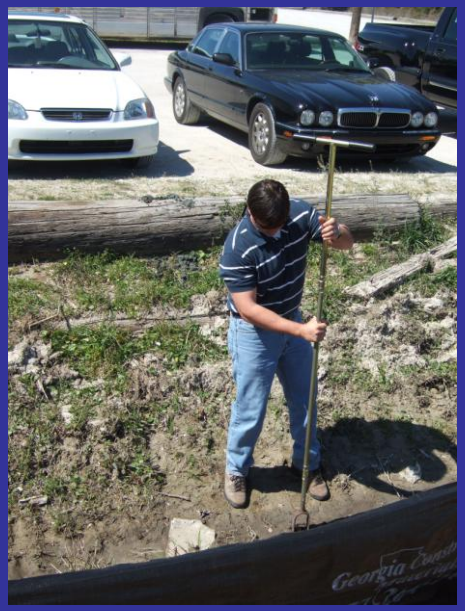
- *Driveway* and *sidewalk edges* can also make good locations

- It's important to watch how water flows during a storm event!!!

How do I know if my yard is a good location?

- The ability of rain water to *drain* is important for your rain garden location

- A simple *"perk" (percolation) test* can help you to decide:



1. Dig a hole about 6 inches deep and wide

2. Fill the hole to the top with water

3. Check the hole 24 hours later – if the water is gone, you have an ideal rain garden location, otherwise, consider a backyard wetland!!

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Where do we put the rain garden?

- > 10 ft. from building foundation
- > 25 ft. from septic system drainfield
- Avoid shallow water tables < 18 in. deep
- Away from utility lines

- Ensure no buried cables or pipes in the excavation area
- In full to partial sun, if possible

When is the best time to build our rain garden?

- Add garden after other construction is finished
- Planting best between November and April
- Or wait until you have friends over that can help!!!

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What size should our rain garden be?

- 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

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

What size should our rain garden be?

- May be limited by the space you have, but smaller is easier!!
- The excavated area should be 6-8” deep
- The area should be typically 8-10 ft. wide in the direction of runoff flow

- Try using a kidney bean or half moon-shaped layout with the inner curve of the area facing the runoff source!!

What is the best soil mix for our rain garden?

- Consider the existing soil for drainage and organic content

- Rain garden soil mix:
  - Sand: 50-60%
  - Compost: 20-30%
  - Top soil: 20-30%

- Mix well in the excavated area

- Mulch cover at least 1 in. deep

- Be sure to use pine bark or similar “non-floating” mulch!!

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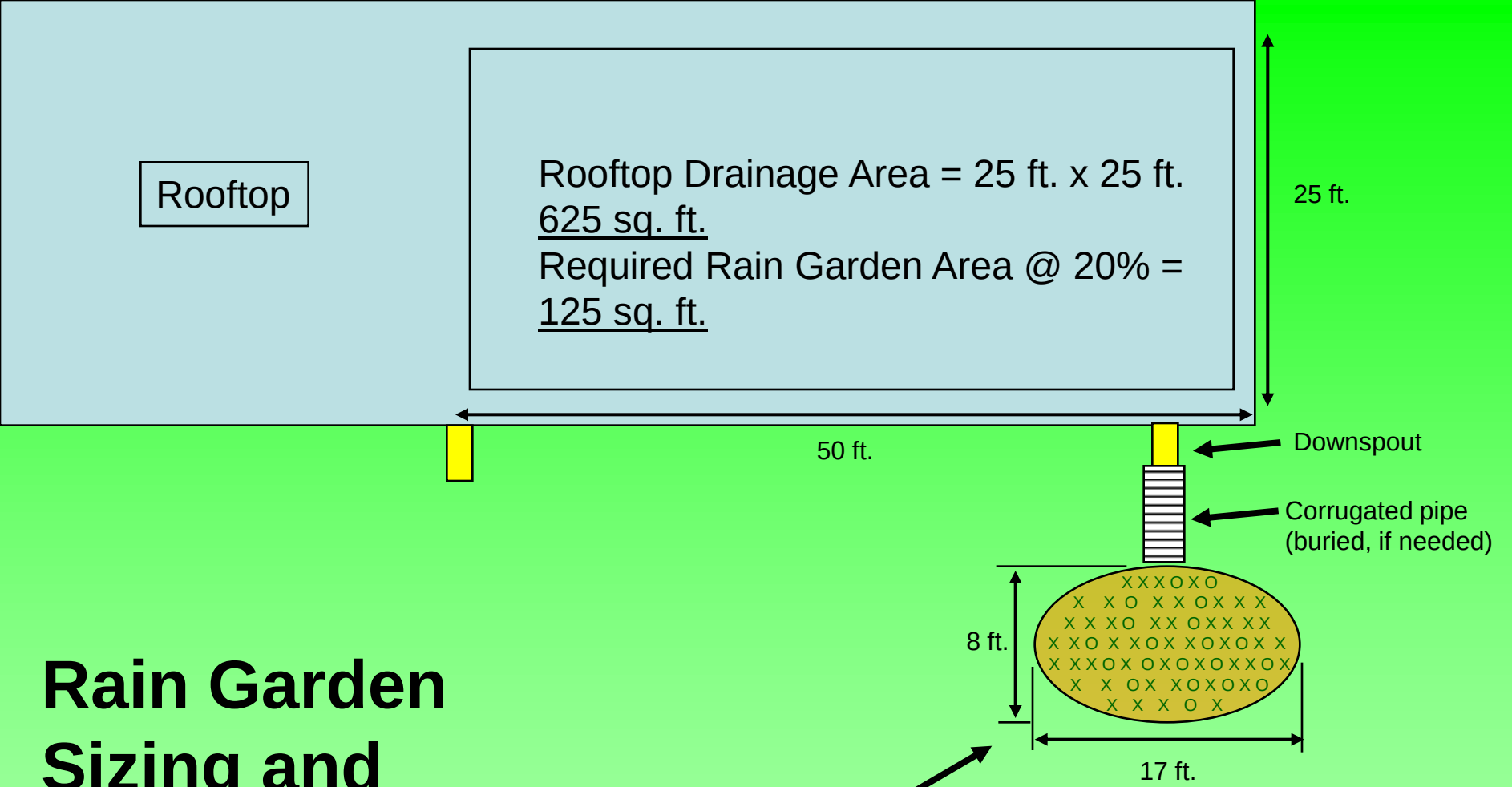
Rain Garden Sizing and Materials Example



Rain garden: 136 sq. ft. area, 8 in. deep = 3.4 c.y.
50-60% sand = 1.7 -2.0 c.y.
20-30% compost = 0.7 – 1.0 c.y.
20-30% top soil = 0.7 – 1.0 c.y.
Plants (depends on type, size, and planting requirements)
Mulch cover 1 in. deep = 0.5 c.y.

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What types of plants should we use for our rain garden?

- Hearty species with a range of drought and wet condition tolerance
- Options include small trees, shrubs, perennials, and grasses
- Please use native species!!
- Plants that attract butterflies and hummingbirds
- A plant list is available – contact your county's Clemson Extension office

Garden Phlox
Phlox paniculata

Gayfeather
Liatris spicata

Sweetgrass
Muhlenbergia filipes

Cardinal Flower
Lobelia cardinalis

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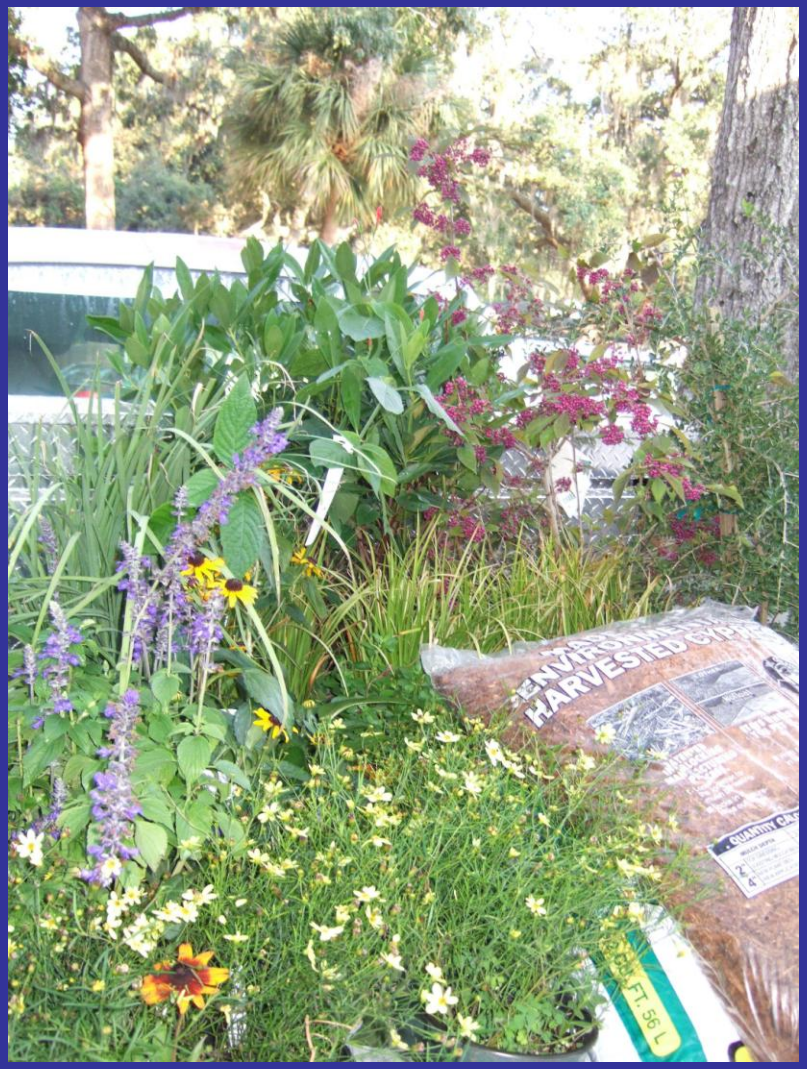
What types of plants will we use for our rain garden today?

- Beautyberry
- Weeping yaupon
- Rudbeckia
- Yellow anise
- Varigated sedge
- Muhly grass (sweetgrass)
- African iris



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Maintenance Requirements!!!

- No sediment loading or erosion – clogs soil mix
- Maintain plant growth by trimming and remove unwanted plants
- Clear debris from inlets and outlets
- Water plants if needed
- Replace mulch as needed
- Core aeration as an option
- Scrape top 1 inch of soil as needed to reduce clogging

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Are there any other important things to consider?

- Water, water, water!!!
- It is <u>extremely important</u> to have a plan for watering and maintaining the garden
- Piping may be needed from downspout for adequate water distribution to the garden

- Consider attaching a *rain barrel* to downspout to collect and evenly distribute rainwater volume

What other tricks are there to rain gardens?

- Plan for removing leftover sod and excavated soil from the rain garden site
- Be sure to watch for buried water lines and electrical cables
- Consider the location of the rain garden and its placement near a water spigot

How much will my rain garden cost?

- For an 8 x 20 ft. garden:
- Plants = $200 (retail; cheaper if you use wholesale or transplanted)
- Soil mix and mulch = $200 (retail; cheaper if you use bulk or fill)
- Labor = free (don't forget to use your friends)
- Total = $400 (~ $2.50 per sq. ft.)
- Protecting water quality = PRICELESS!!

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How much will our rain garden cost?

- For our rain garden:
- Plants = $200
- Cotton compost and cypress mulch = $35
- Labor = free (we have fantastic volunteers!!)
- Total = $235
- Protecting water quality = FUN!!

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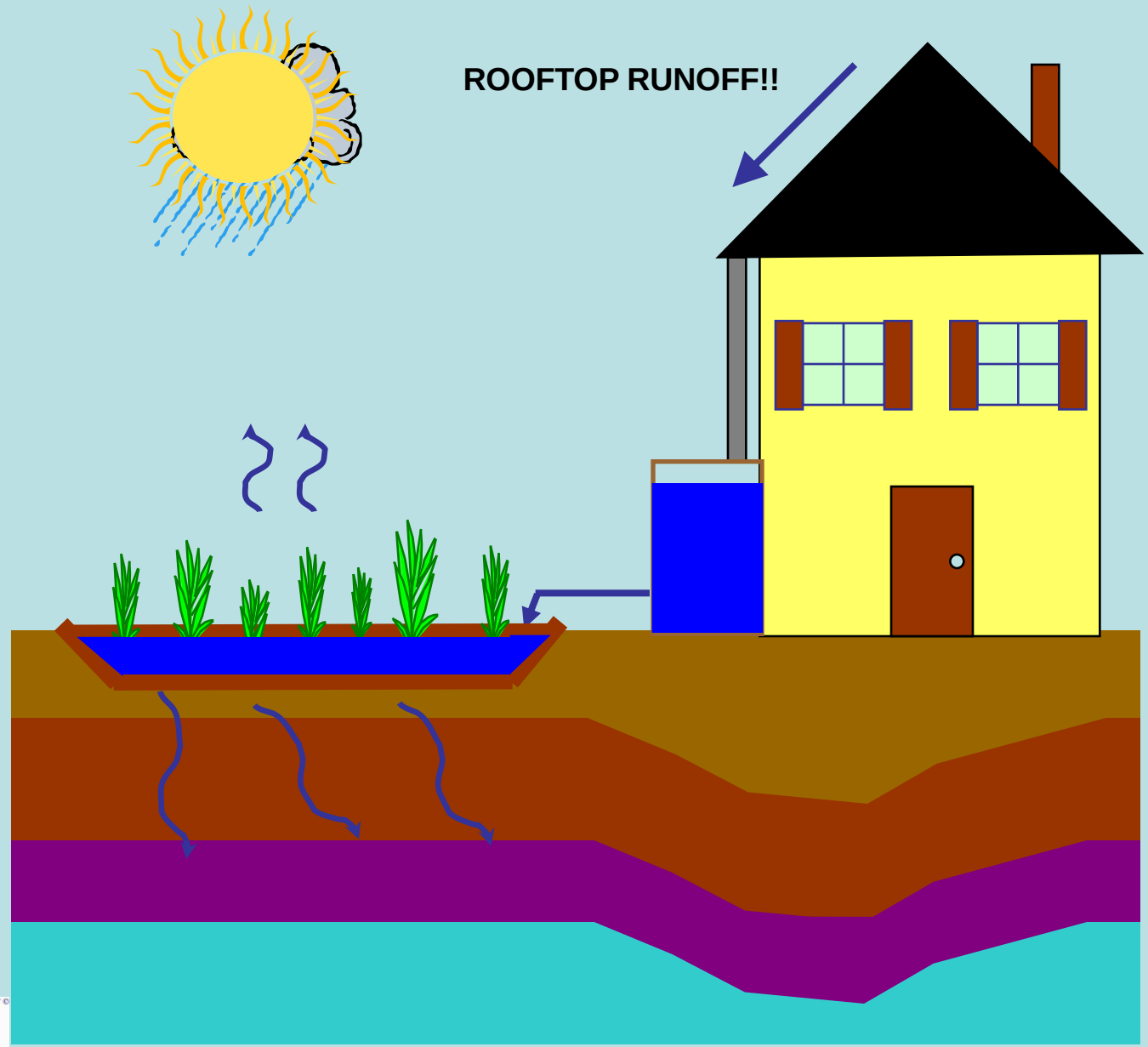
Urban Water Budget – Rainwater Harvesting Scenario



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Rainwater Harvesting

- Rainwater collection,storage, and use = “harvesting”
- Not unlike the old “cistern”
- Barrels come in all shapes and sizes
- Can be used for water reuse such as for irrigation

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Why install a Rain Barrel?

- Saves you $$ by lowering your water bills
- Reduces demand on the water supply
- Makes efficient use of a “free” valuable resource
- Reduces flooding, erosion, and stormwater flows and pollution

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What do you need?

- Gutters and a downspout
- Storage tank – from small (35 gal) to large (225 gal - 75 gal in series)!
- Debris screen and lid – filters leaves and pine needles, and provides safety and mosquito protection
- Distribution device – spigot and hose, or even a pump
- Cost: $35 to $300, or you can make one!

From Mark Messersmith:
College of Charleston grad student

From the News and Observer:
Feb. 22, 2008 - Raleigh, NC
newsobserver.com

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How much rainwater can you harvest?

Supply (gallons)	=	Rainfall (inches)	x Roof Area (sq. ft.)	x 0.623	x Runoff Factor

Example: Monthly Amount of Rainwater Harvested

3 inches of rainfall	x	625 sq. ft. roof area	x 0.623	x 0.9	=	> 1,000 gallons!!!

1,000 gallons for 30 days equals ~ 35 gallons per day

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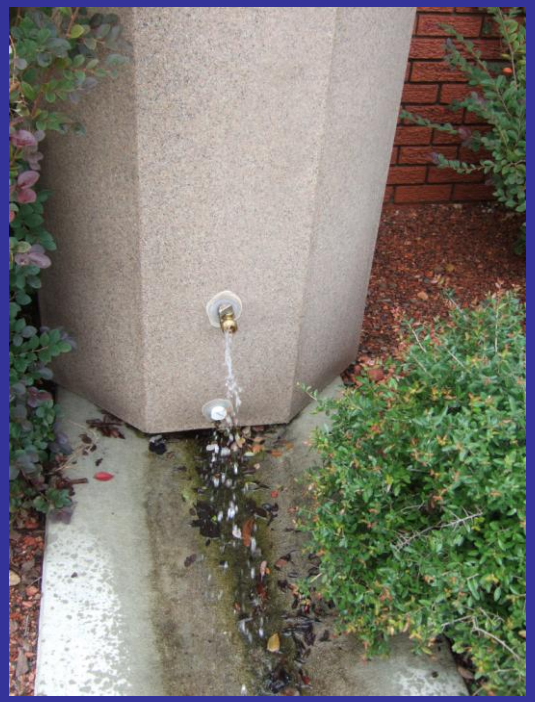
Rain Barrel Maintenance and Safety

- Rainwater collected is not safe to drink or bathe without treatment
- Frequently clean debris screen to prevent clogging
- Ensure lid is tightly fit to prevent mosquitoes
- If you make your own, be sure the old barrel is free of toxins and food residue



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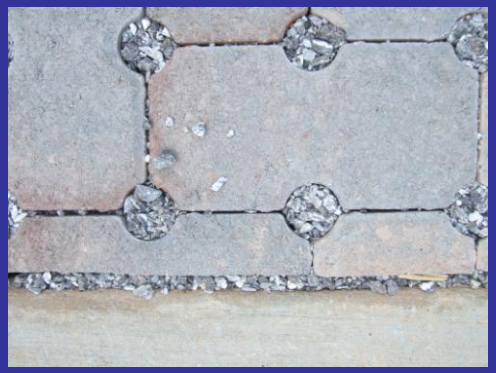
And don't forget to…

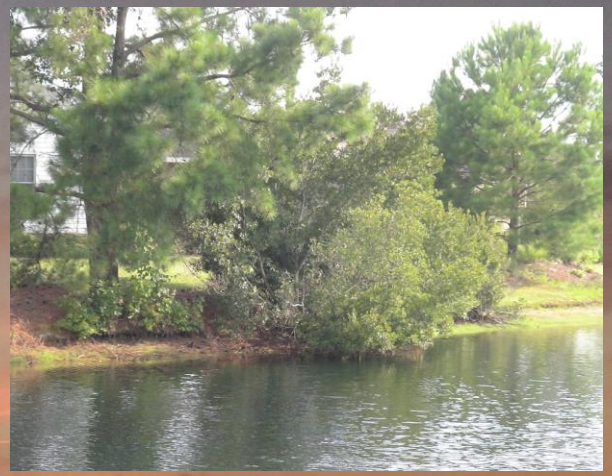
- Use a flexible downspout to connect to storage tank
- Elevate the tank on a platform to aid gravity distribution
- Have an overflow diverted away from house and popular areas, with splashplate to prevent erosion

From Gardeners Supply: www.gardeners.com

Other Ideas for Stormwater Management??

- Rain gardens √
- Rain barrels √
- Pervious materials
- Buffers
- Backyard wetlands
- Maintenance!!!





??? Questions ???

For more info, please contact:
Dr. Dan Hitchcock
dhitchc@clemson.edu
or your local County
Clemson Extension office

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