TENNESSEE YARDS & NEIGHBORHOODS

Does Your Yard Measure Up?

Managing Your Yard to Protect and Enhance Water Resources

Parci Gibson, Knox County Stormwater Management

UT Extension

KNOX COUNTY STORMWATER

The Tennessee Landscape: Making the Land-Water Connection

Land-Water Objectives

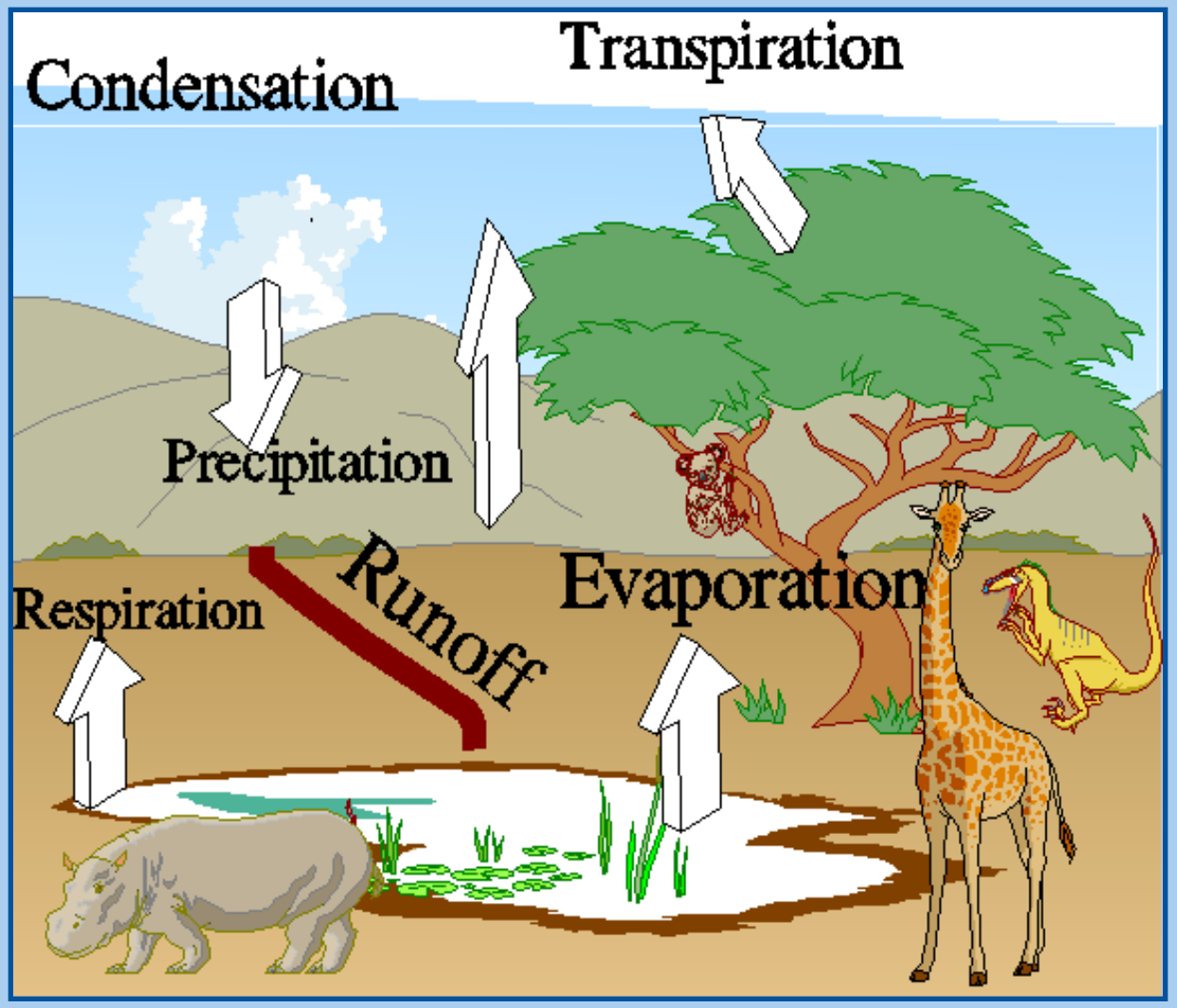
- **Highlight the significance of water**
- **Describe the journey of stormwater**
- **Describe actions to help protect our waterways**

Water

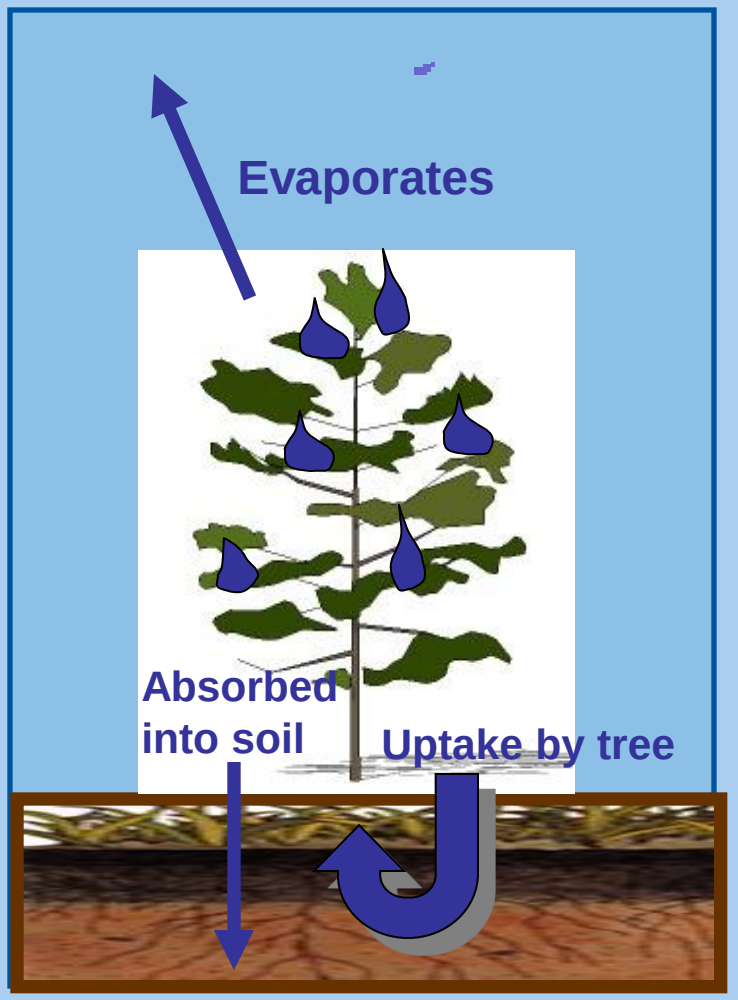
An Integral Part of our Home Landscape

Water: The Source of Life

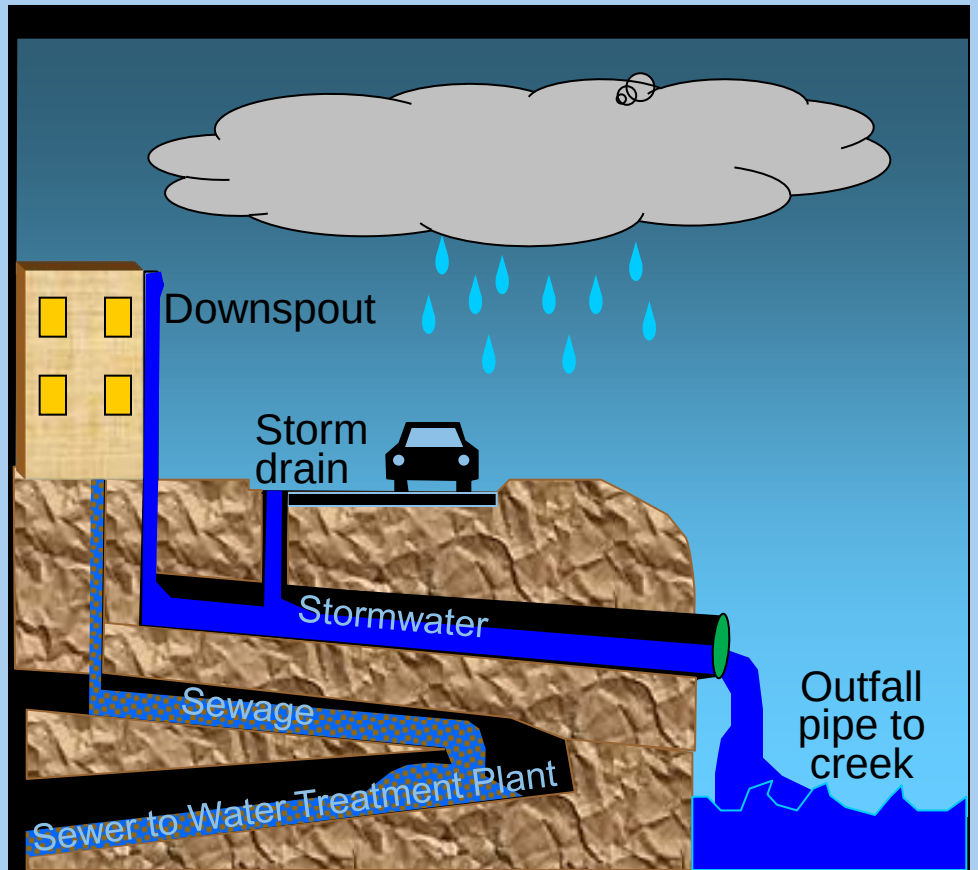
Health, Environment, Economy, Recreation…



No more, no less!


Evaporates
Absorbed into soil
Uptake by tree

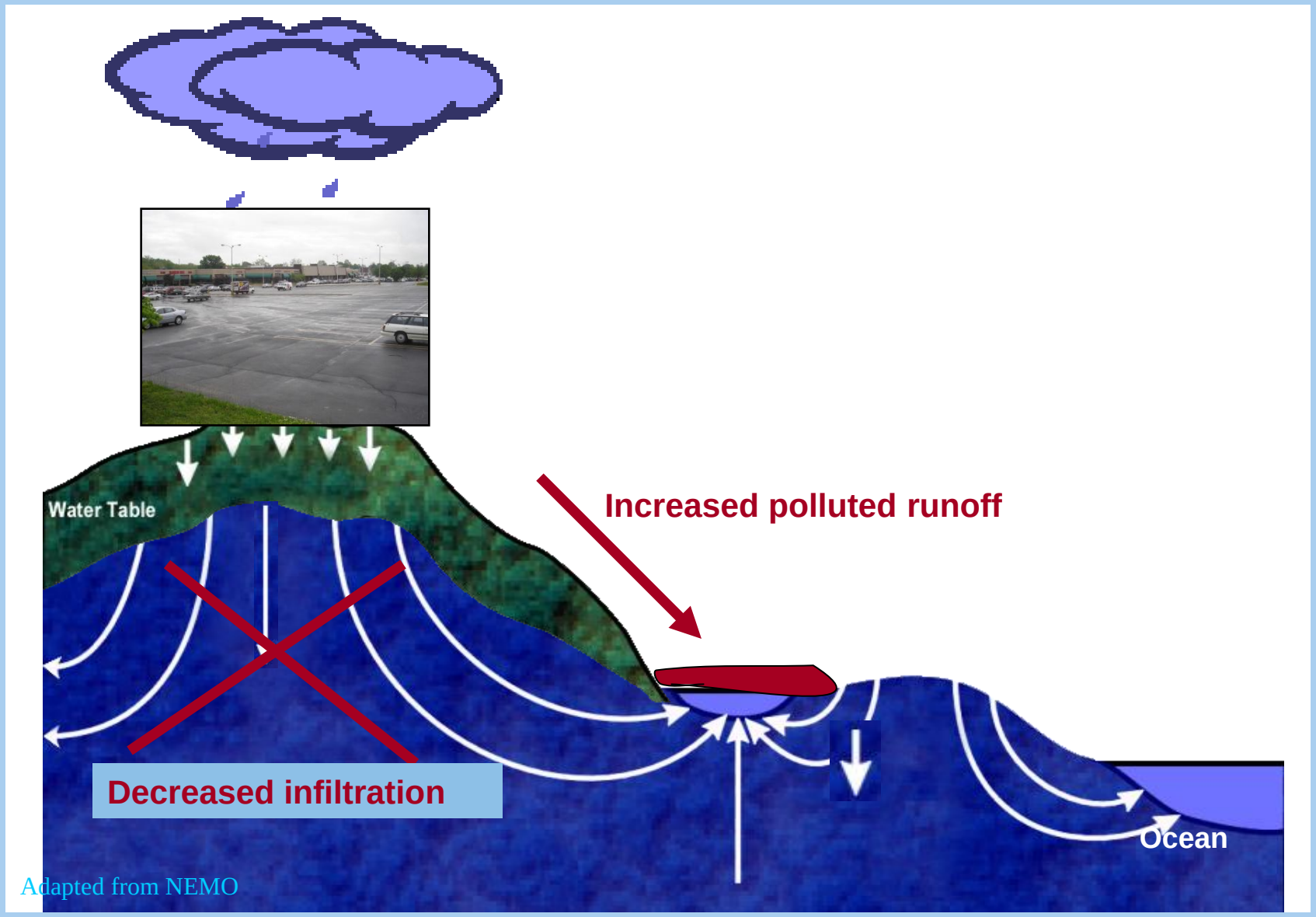

KEEP CLEAN!


Downspout
Storm drain
Stormwater
Sewage
Sewer to Water Treatment Plant
Outfall pipe to creek

Stormwater pollution is caused by rainfall moving over the ground picking up pollutants and depositing them into rivers, lakes, wetlands and ground water.

The impact by an individual stormwater source may be small but the cumulative effect can significantly degrade water quality. These pollutants can kill aquatic life and limit the use of our waters for recreational or other purposes.

Impervious Surface Impacts



Adapted from NEMO

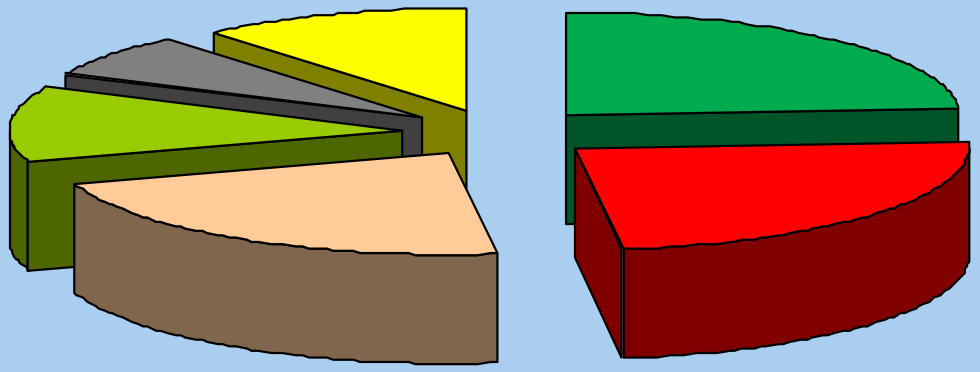
Stormwater Runoff

More Hard Surfaces = Greater Volume & More Pollutants

More hard surface, less infiltration = more pollution, bigger floods & less water in creeks and rivers in times of drought

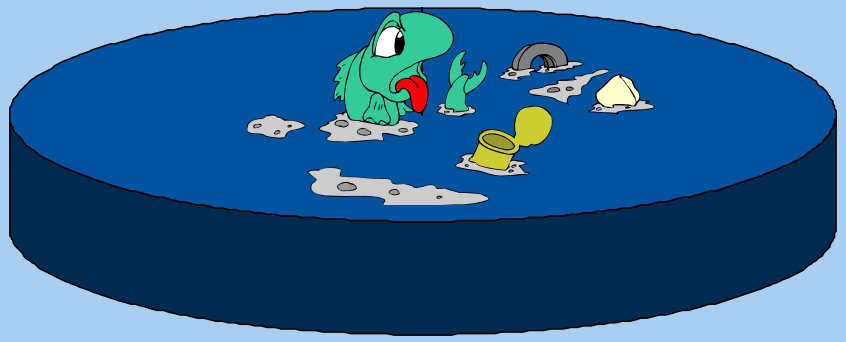
Tennessee Waterways

Predominant Water Quality Impairments



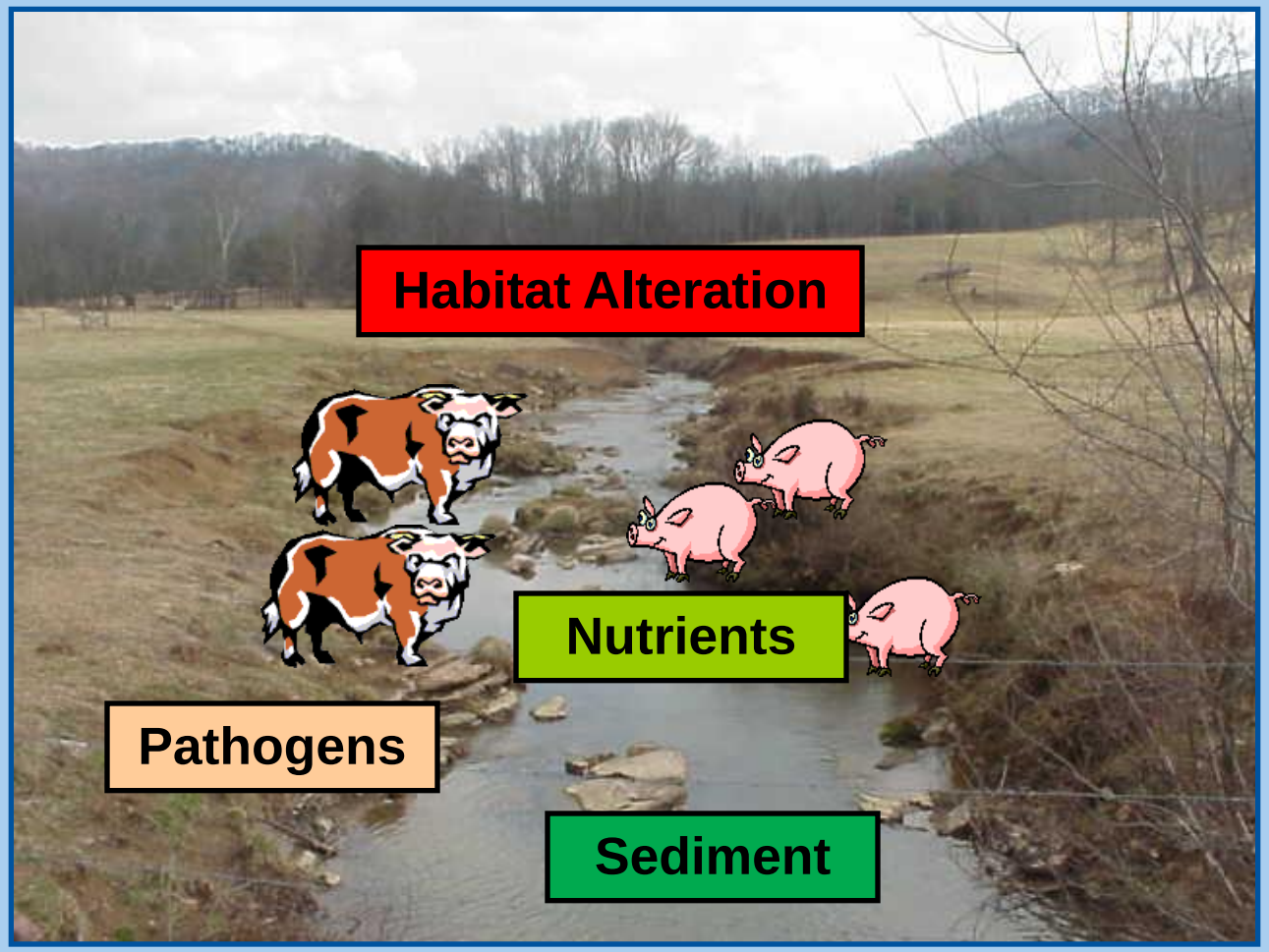
- Sediment
- Habitat Alteration
- Pathogens
- Nutrients
- Toxins
- Other

Other Significant Social & Economic Waterbody Issue



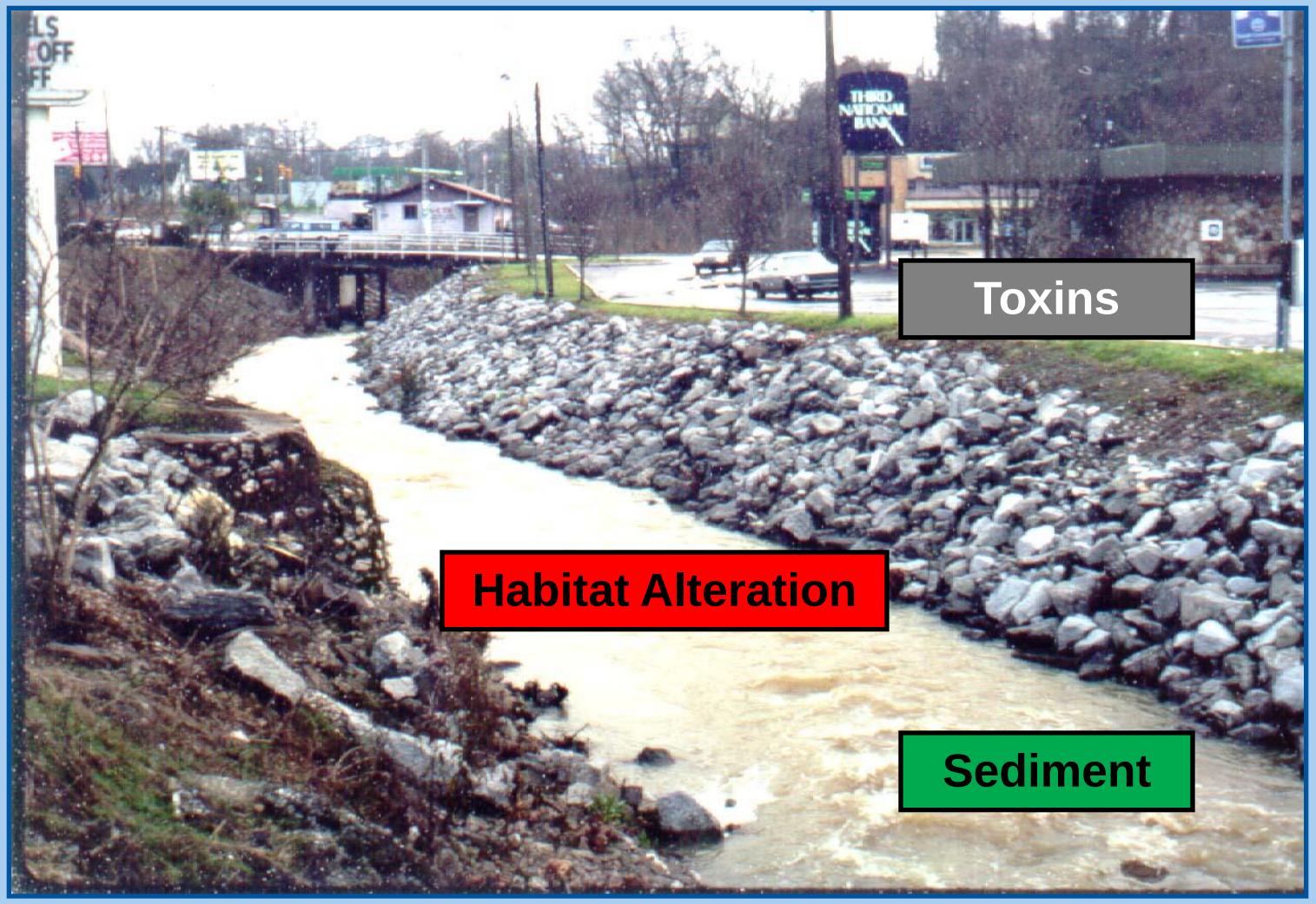
- Trash

Sources of Impairments



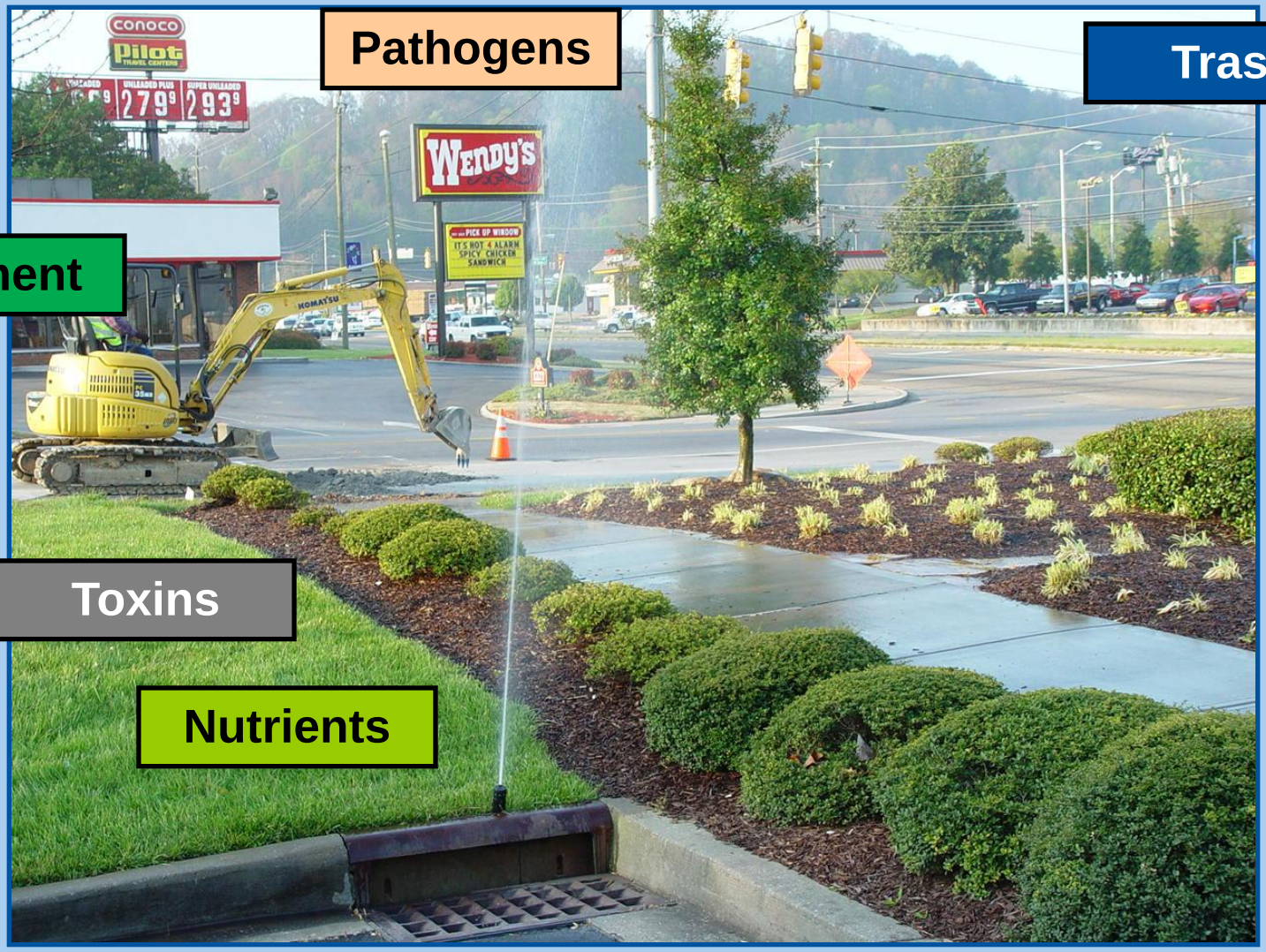
Agricultural lands -- Multiple Impairments

Sources of Impairments



Commercial Properties -- Multiple Impairments

Sources of Impairments

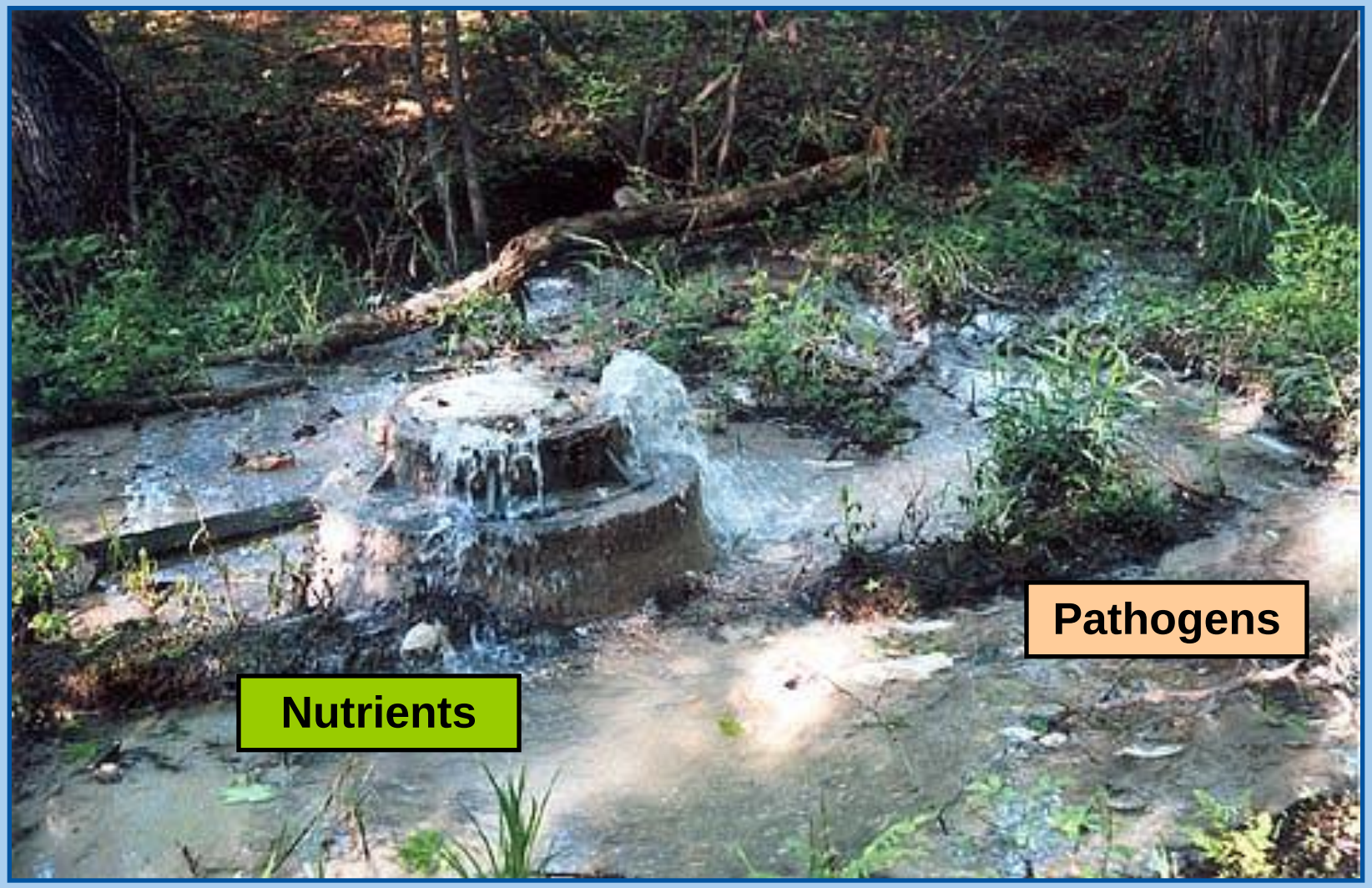


Commercial Properties -- Multiple Impairments

Sources of Impairments

Construction -- Multiple Impairments

Sources of Impairments



Sewer Infrastructures - Multiple Impairments

Waterbody Impairment Impacts

Sediment

Nutrients

Increases in temperatures

Increase in algae growth & decay

Low oxygen levels

Waterbody Impairment Impacts

Toxins

Sediment

- **Decreased habitat for aquatic life**
- **Increased flooding**

Pathogens

Increased aquatic life & human diseases

Waterbody Impairment Impacts

Trash

- **Taxpayer's Direct Cost**
  - $1 Million – Avg in TN
  - Additional local municipal costs
- **Indirect Costs**
  - Water contamination – carrier of toxins & bacteria
  - Road debris - cause of 25,000 crashes/year
  - Reduction in property values, community pride

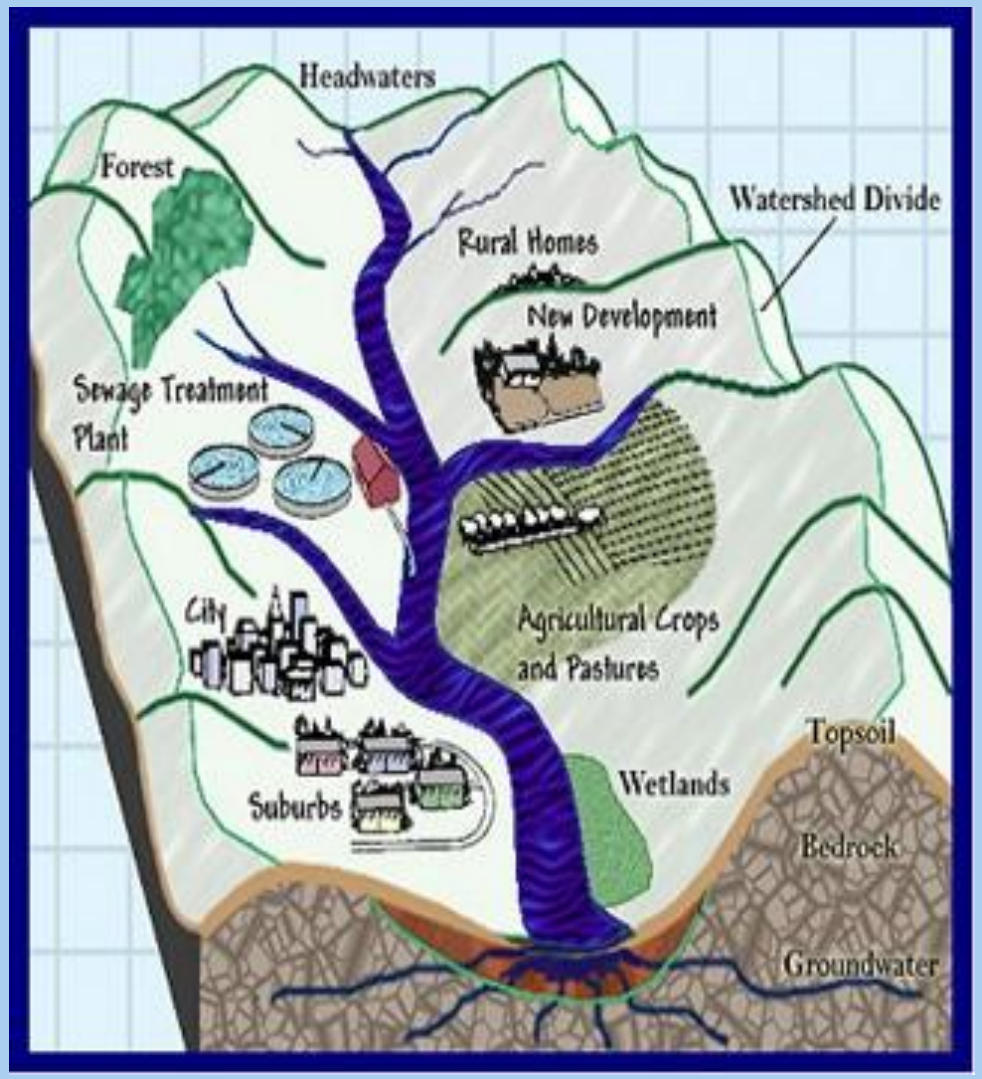
Potential Pollutants

Yards & Neighborhoods

Sources & Solutions

- Sediment
- Habitat Alteration
- Pathogens
- Nutrients
- Toxins
- Other

- Trash



Sediment Sources

Yards & Neighborhoods

Exposed lawn soils

Eroding ditch lines

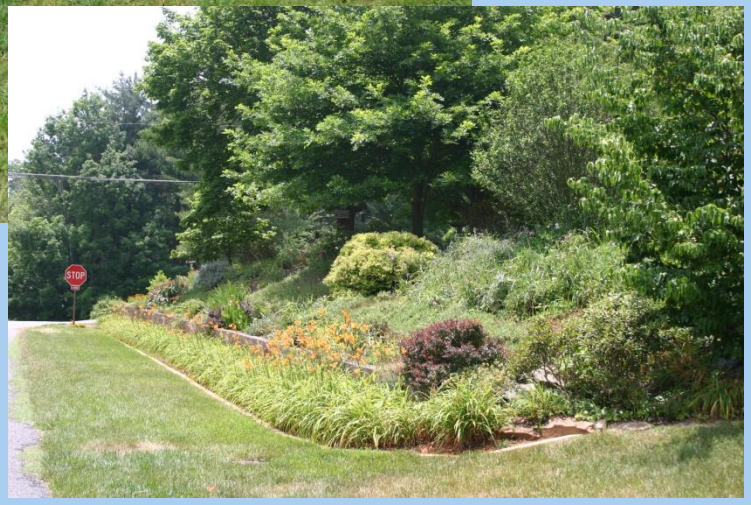
Home construction

Exposed soils in sloping gardens

Sediment Solutions

Yards & Neighborhoods

Grass line eroding ditch lines



Cover slopes in turf, ornamental or native grasses, perrenials

Mulch sloped areas

Pathogen Sources

Yards & Neighborhoods

Pet waste on or near pavement

Average dog waste = ~¼ lb per day. With 500,000 dogs in Knox County = 62.5 tons of waste

Septic system failure

Grease down drains can cause clogged sewer lines

Pathogen Solutions

Yards & Neighborhoods

Properly dispose of dog waste

Maintain septic systems

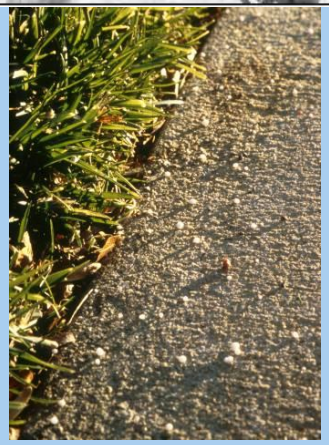
Properly dispose of grease

Nutrient Sources

Yards & Neighborhoods

Detergents

Yard Debris

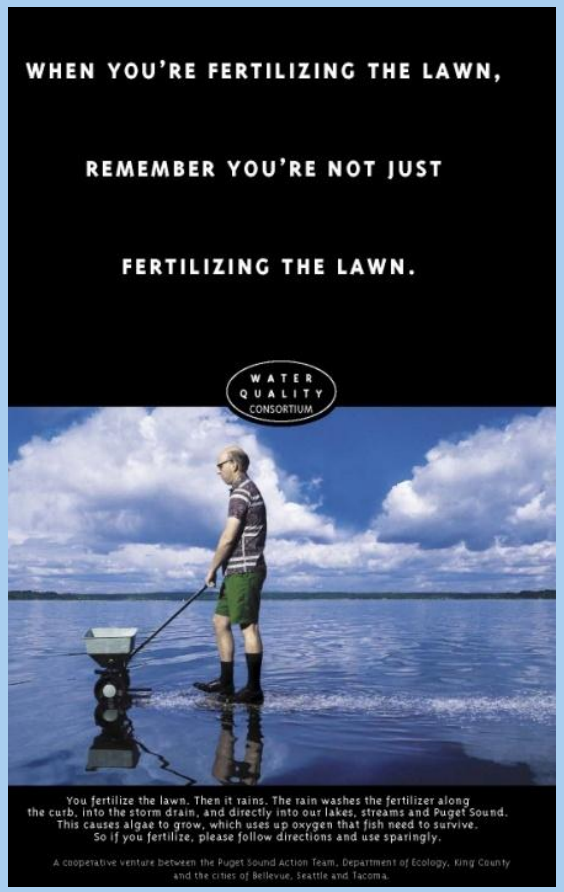


Excess Fertilizers

Pet Wastes

Nutrient Solutions

Yards & Neighborhoods



Fertilize appropriately

Sweep up fertilizers on paved areas

Wash vehicles on lawn

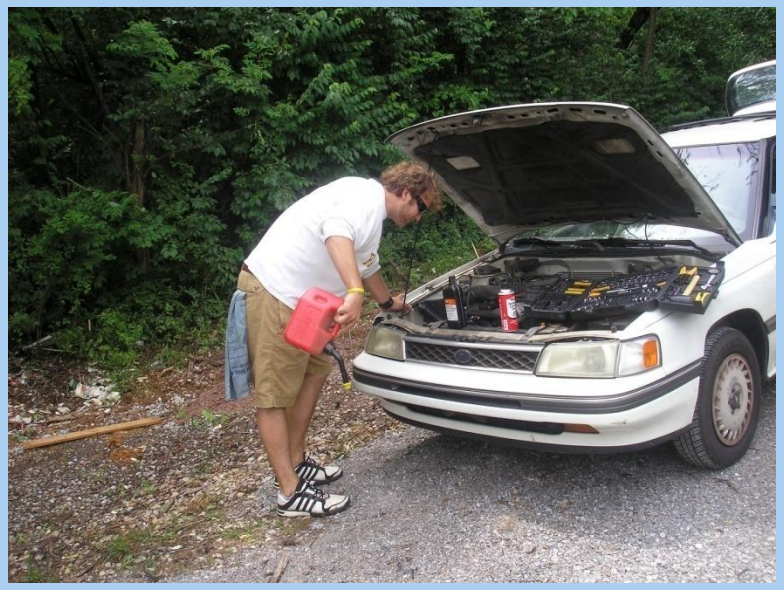
Dispose lawn clippings via municipal recycling or compost

Properly dispose of pet waste

Toxin Sources

Yards & Neighborhoods

Improperly applied, stored & disposed of pesticides, paints, cleaning supplies…



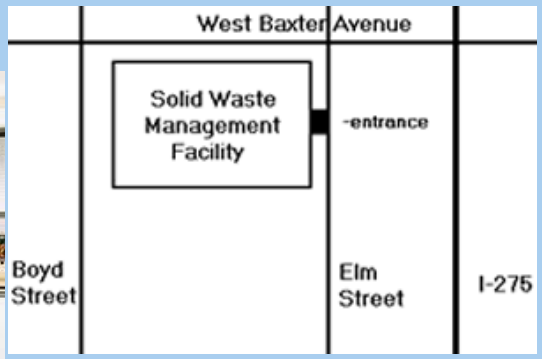
“Shade Tree” Mechanics:
Home car repairs & improper disposal

“Shady Tree” Mechanics:
Report in Knox Co.: 594-6035

Toxin Solutions

Yards & Neighborhoods

Read pesticide labels – apply according to directions



Properly store & dispose of hazardous substances

Use least toxic pesticides or follow IPM guidelines

Maintain car to avoid leaks

Trash Sources

Yards & Neighborhoods

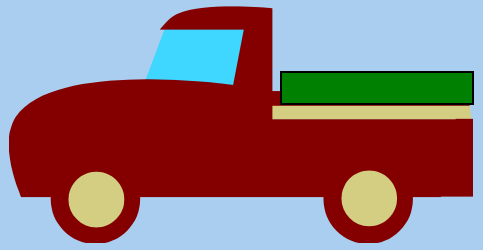
Overflowing Trash Cans

Drive-by Litter Bugs

Trash in Truck Beds

Trash Solutions

Yards & Neighborhoods



Tarp trash in truck beds

Properly dispose of household waste

Keep litter bag in car

Join an Adopt-A-Road or Adopt-A-Stream Program

See a litter bug?

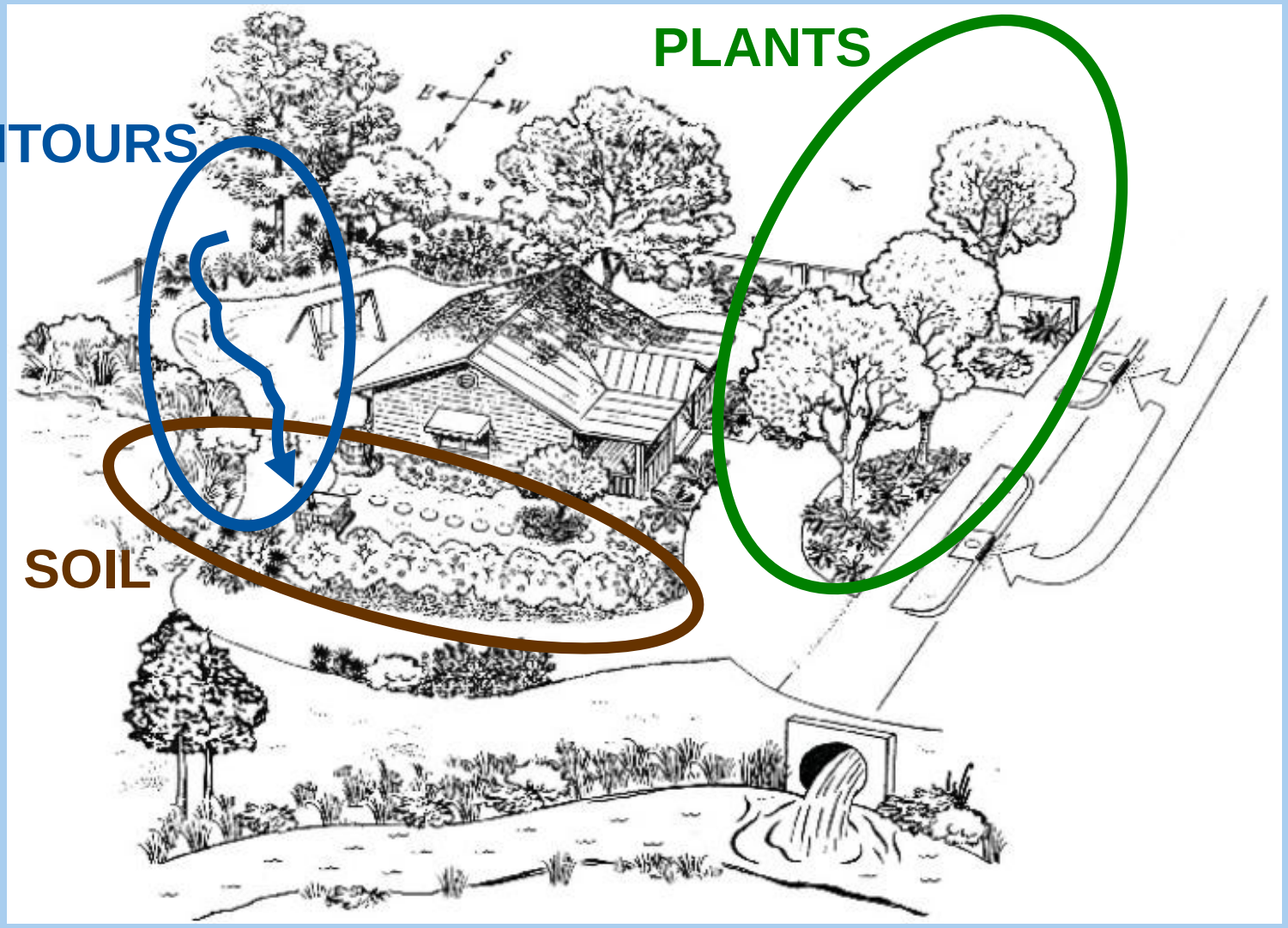
Call 1-877-8-LITTER

www://stoplitter.org

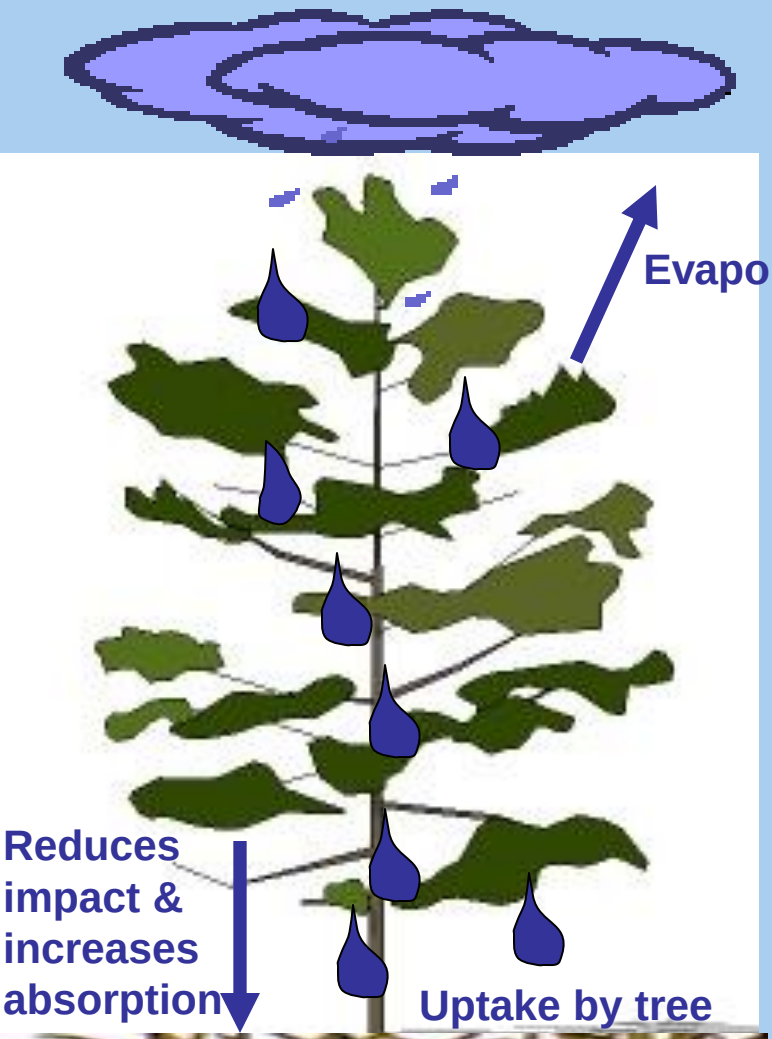
Putting the Land-Water Connection into Action:

Home Stormwater Strategies

Making the Most of Your Yard's Natural Features



Natural Landscape Features & its Interaction with Stormwater



Trees

- **Collect** rain water (“Intercept” it)
- **Slow & convey** its flow
- Roots **absorb** (uptake) rain water

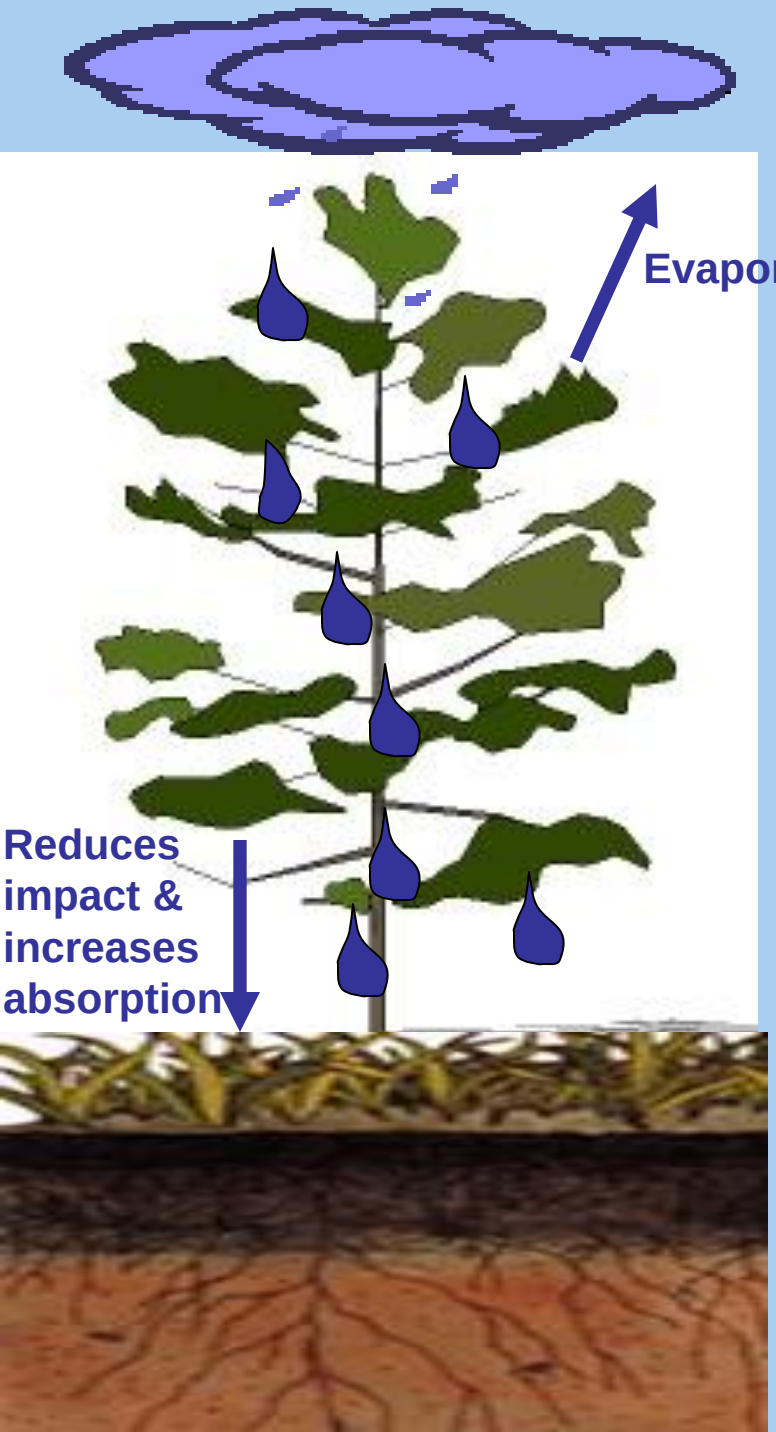
Soils

- **Absorb (infiltrate) rain water**
- **Filter out pollutants**

Contours

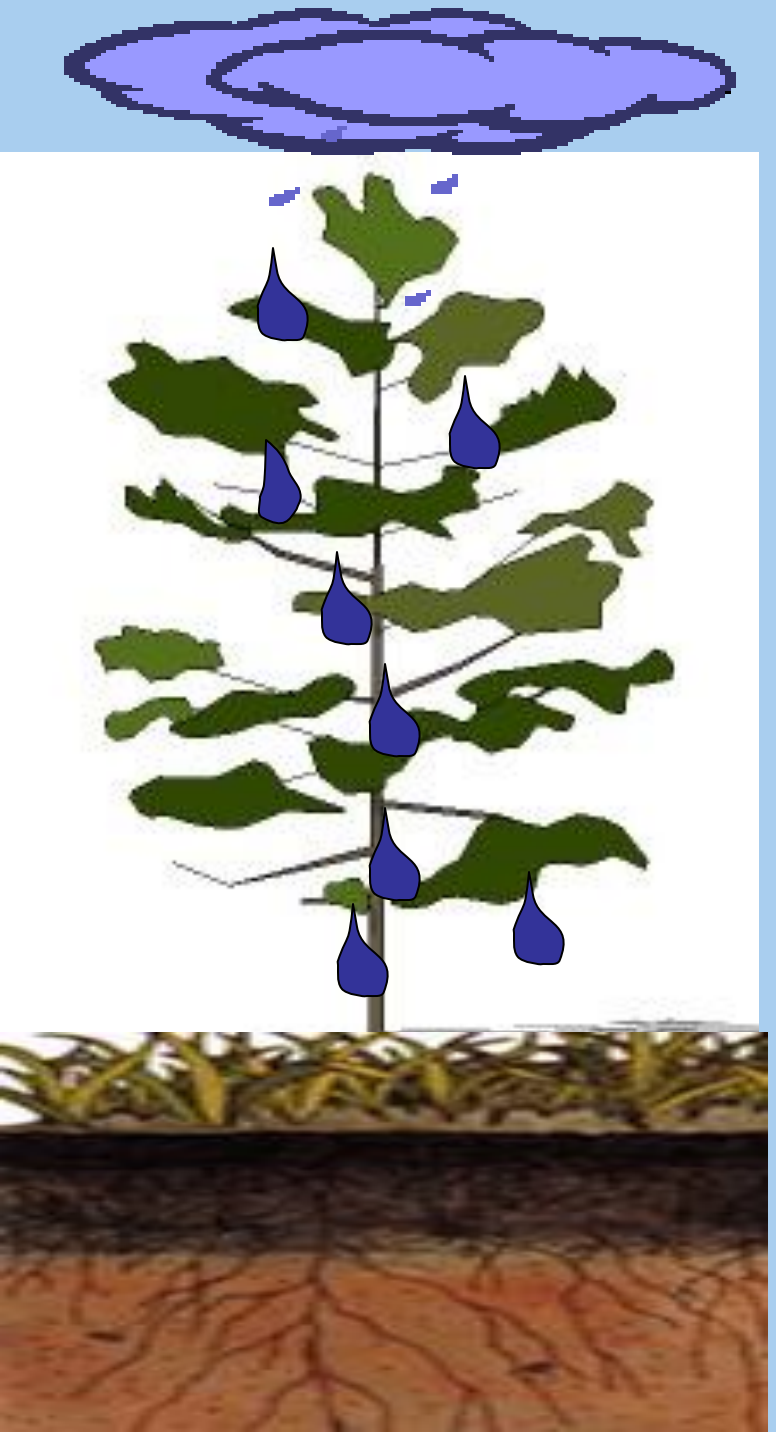
- **Collect**
- **Convey & absorb rain water**
- **Filter out pollutants**

Natural Landscape Features & its Interaction with Stormwater



Trees

- **Collects & disperses**
  - **Mature tree intercepts 40-60% of 1/2” rain**
- **Absorption/Uptake**
  - ***Deciduous medium size tree:*** **Uptake of 350+ gallons stormwater per year**



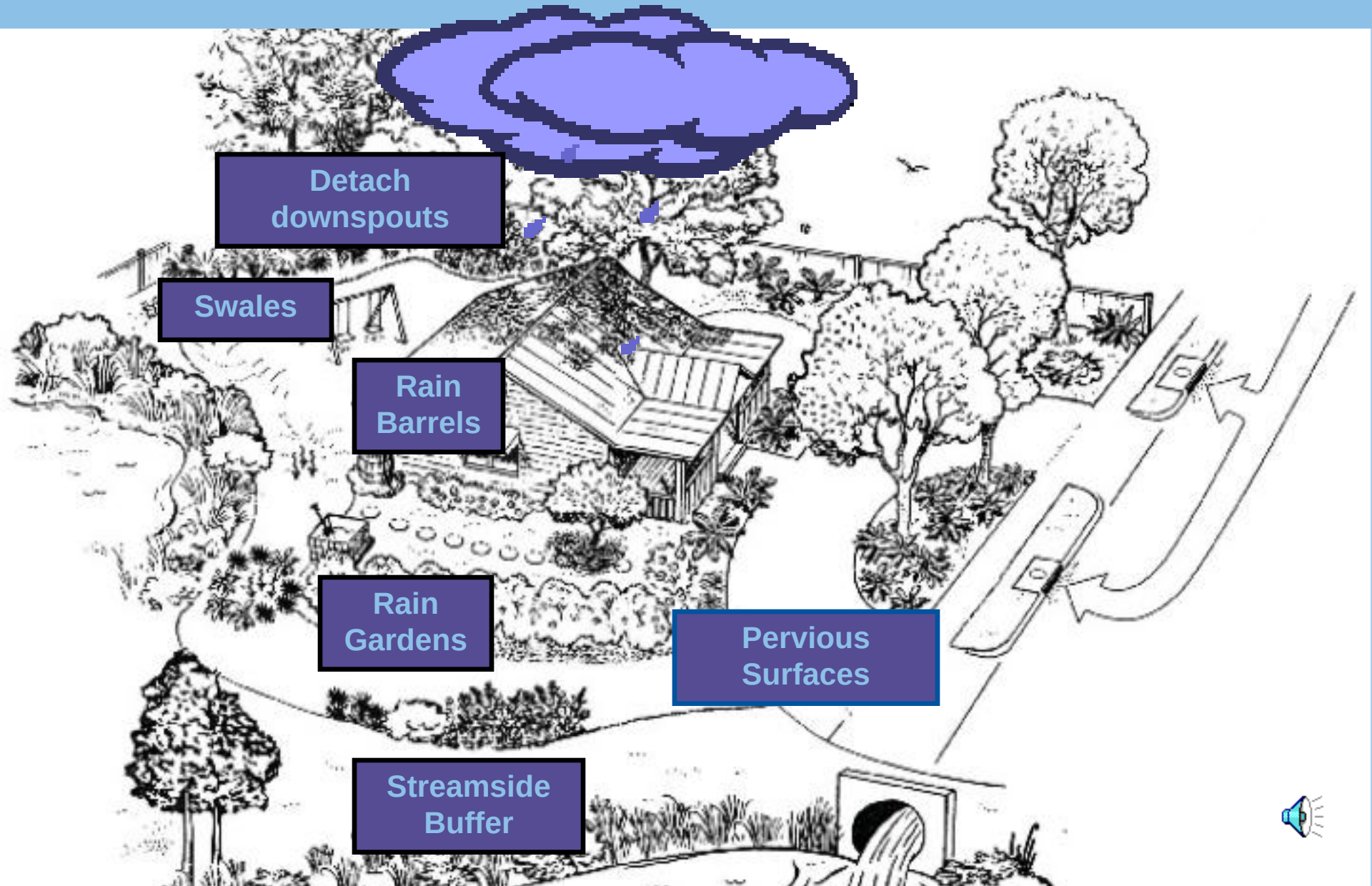
Natural Landscape Features & its Interaction with Stormwater

Soil

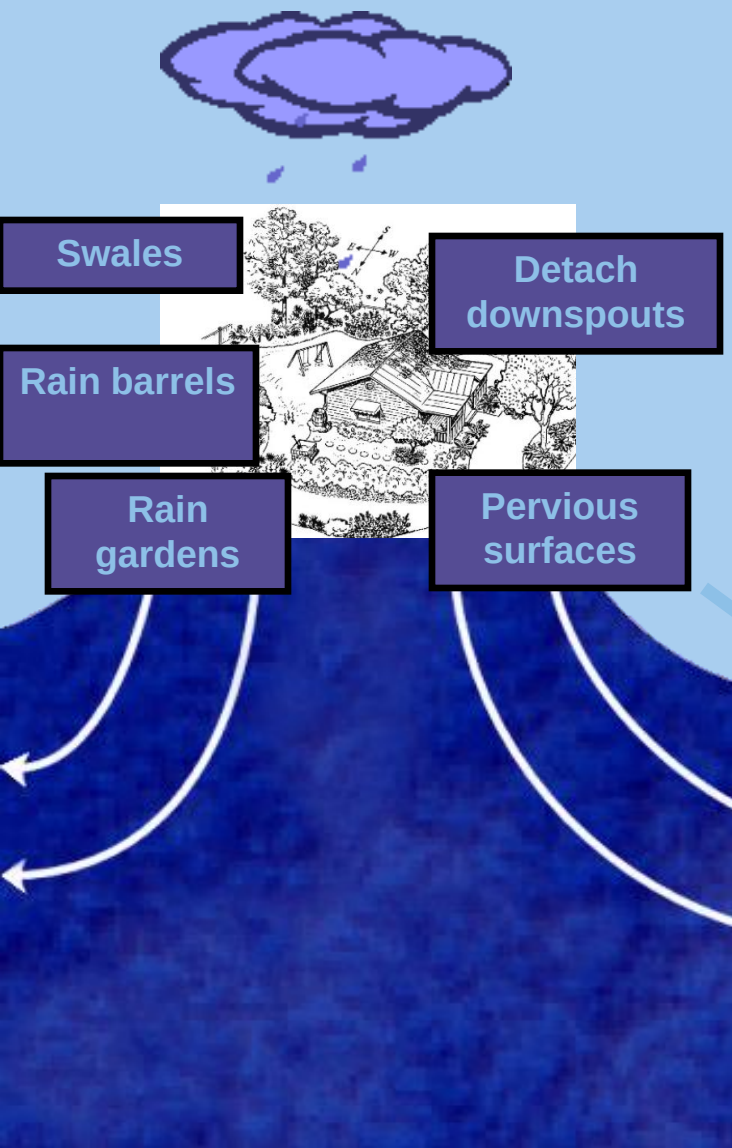
- **Absorption**
  - Composition & compaction affects volume of run-off
  - With 1” rain in 24 hours:
    - Highly organic soil infiltrates 99%+ rain water
    - Hard compacted soil infiltrates less than 20%

- **Filtration of pollutants**
  - Microbes break down organic contaminants
  - Reduces bacteriological content

Home Stormwater Strategies



Benefits of Home Strategies



- Reduce yard ponding & stormwater runoff
- Reduce stormwater runoff & associated pollutants
- Replenish groundwater stores & streams
- Allow for better surrounding plant growth

Pervious (Porous) Surfaces

Surface structures that allow for rain water infiltration into subsurface soil layers

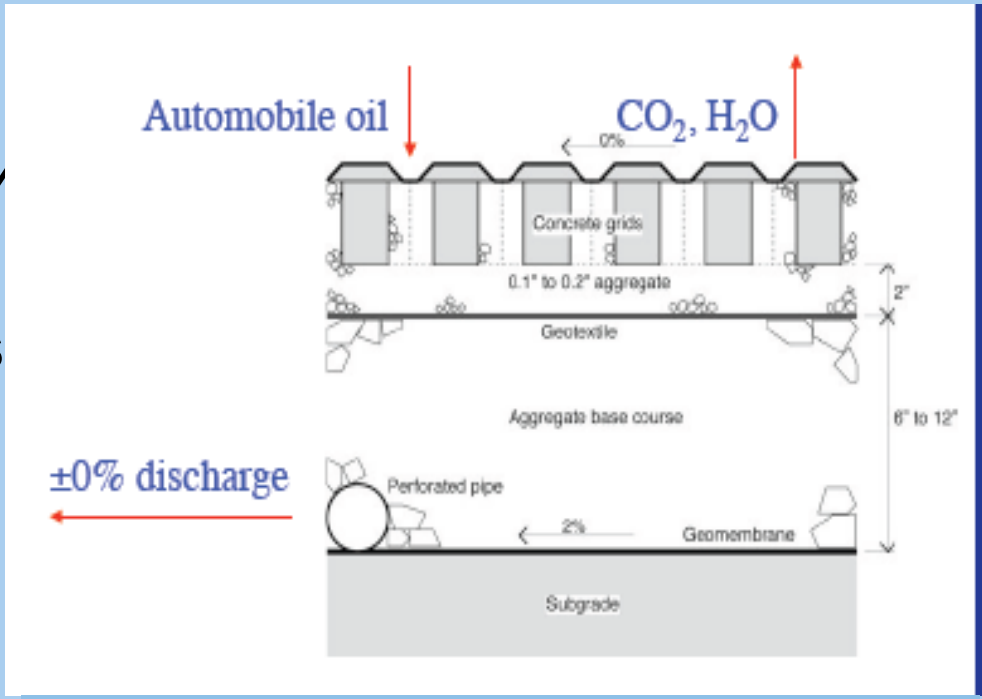
- Pervious concrete
- Flexible plastic porous pavement
- Porous paver block systems
- Aggregate porous surfaces
- “Hollywood Driveways”

Pervious Concrete

- Mixture of Portland cement &/or other blended cements with aggregate stone (e.g., 1” with 40% void space) & water

Benefits

- **Reduces runoff: 60 – 100%**
- **Very high infiltration rates 140 in/hr – 600+ in/hr**
- **Filters out most oils, heavy metals, bacteria, some nutrients**



Source: B Ferguson Porous Pavements, CRC, 2005

Pervious Concrete

Installation (Important!)

- **Installers**
  - **Certified by National Ready Mix Concrete Association**
  - **Contact TN Concrete Association for qualified installers**
  - **More info: www.perviouspavement.org**
- **Multiple sublayers - number & type vary by stormwater storage needs & soil type**

Maintenance

- **Routinely sweep or vacuum**

Cost: **$4 per square foot excluding excavation & sublayers**

Pervious Surfaces

Flexible Plastic Porous Pavement

- Lattice-like open celled plastic structure that holds gravel or turf grass

Invisible Structures, Inc.

Pervious Surfaces

Flexible Plastic Porous Pavement - Installation

Pervious Surfaces

Flexible Plastic Porous Pavement

Usage

- Grass: 2- 6 car trips daily over same spot
- Gravel: no limits on usage

Maintenance

Grass: Same as a turf lawn – mow, water, etc. (keep leaves & twigs up)

Gravel: – Keep leaves etc. raked off; periodic sweeping to keep level

Cost

$5 - $6 per square foot

Pervious Surfaces
Paver Block Systems

- Impermeable blocks made of brick, stone, or concrete with joints between that are filled with sand or grass

- Can be interlocking or not

Installation

- **On a prepared sand base**

Pervious Surfaces

Porous Paver Block Systems

- **Tailor to your taste - variety of shapes, colors, & patterns; can be incorporated into highly formal to casual gardens**

Maintenance: Periodic refilling voids

Cost: Highly variable $5 – $10 sq ft

Pervious Surfaces

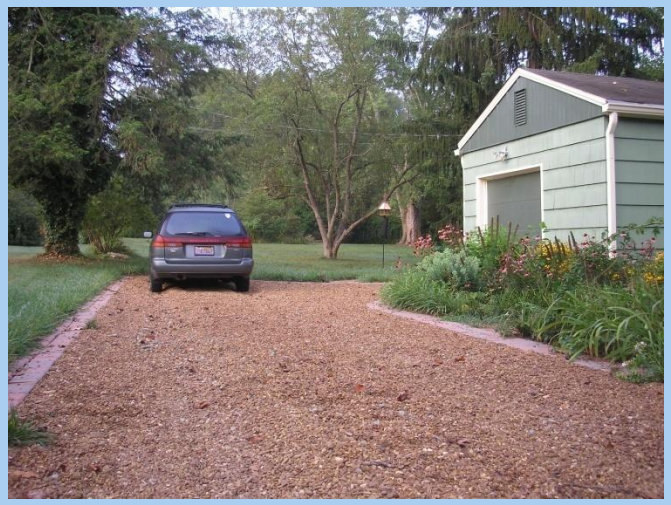
Aggregate Porous Surfaces

Your basic ‘ole gravel drive

Maintenance

- Periodic addition of gravel
- Raking
- Filling in ruts

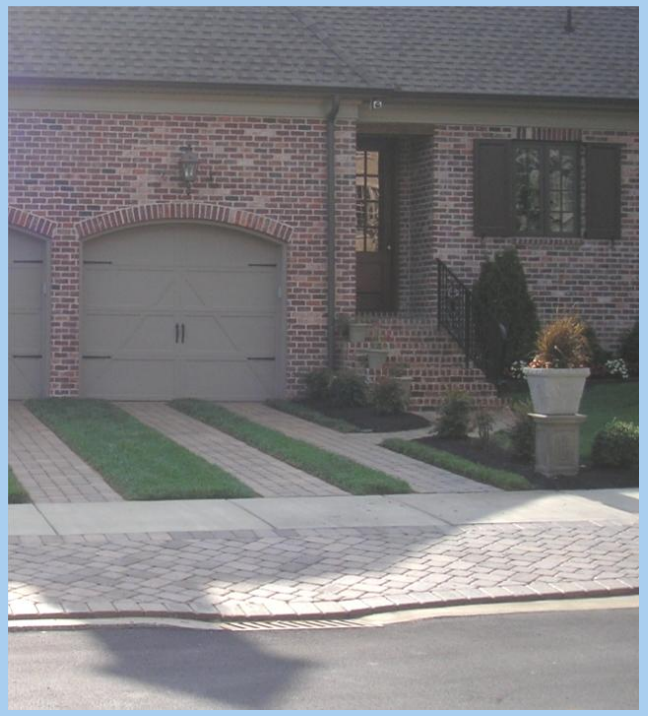
Cost: .50 - $3.00 sq ft (Highly variable according to gravel type, thickness, paver border)



Pervious Surfaces

"Hollywood Drives" – Consider Yourself a Star

A drive with a dividing strip of grass or gravel



- Materials used dictates degree of infiltration
  - Impermeable pavers with gravel or grass strips
  - Porous pavers with gravel or grass strips
  - Flexible plastic porous systems using combination of gravel & turf

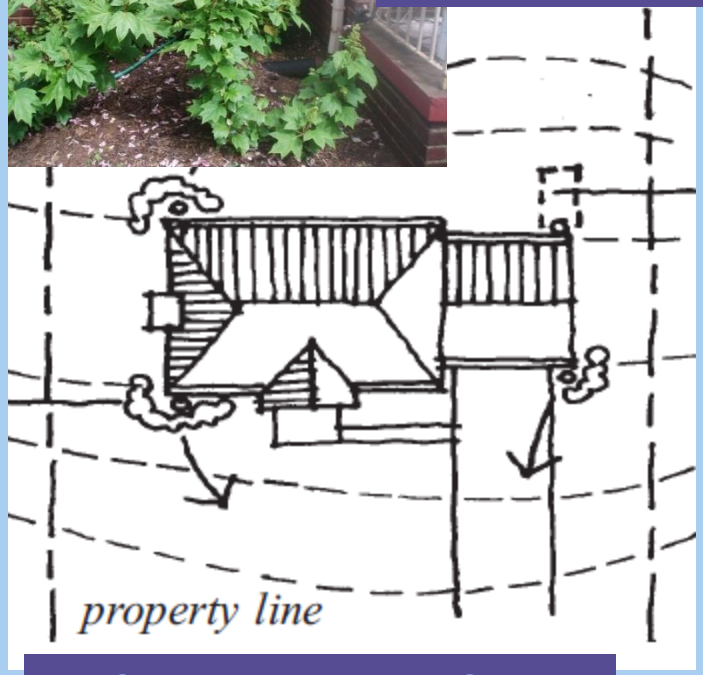
Downspout Detachment

- **Disconnect downspouts that direct water from rooftop to community stormwater system**

- Functions
  - Increases localized infiltration
  - Watering of gardens

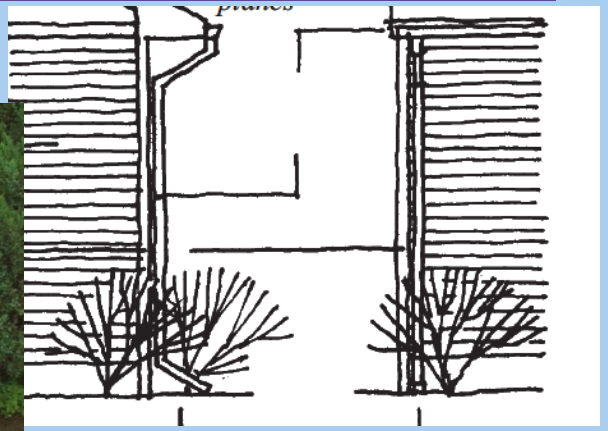
Downspout Detachment Tips

Direct rooftop flow to a permeable surface: garden or lawn



Direct water away from your (and your neighbors) house foundation (3 ft or more)

Minimize erosion
Use splashguard, mulch, maintain heavy ground cover below outfall



Hide downspout extensions with plant materials

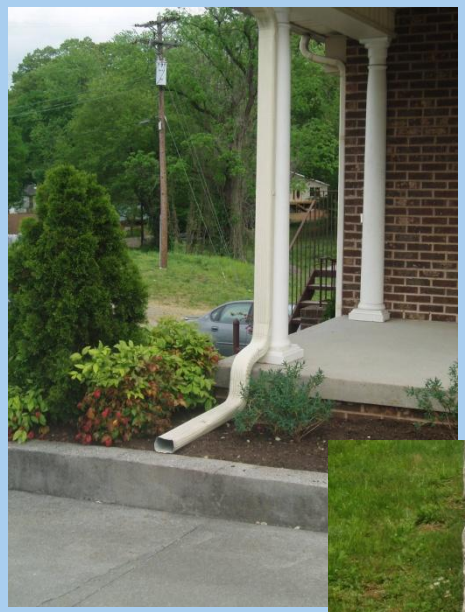
<u>Maintenance</u>

Keep gutters clean

Replace degraded piping

Downspout Detachment Tips

Avoid directing water to foundation or to impervious surfaces



Extend piping

Maintain piping

Extend garden to create visual screen

Place splashguards in proper location

Rain Barrels

A not-so-new system to collect & store rainwater that would otherwise be lost to runoff

Uses

- **Water lawns & gardens & save on water bills! (about 40-60% summer water bills on landscapes)**
- **Window washing - free of chlorine, lime, calcium**
- **Scrubbing Fido, watering porch plants, filling bird feeders…**

Rain Barrels: Water Savings

- 1 in rain over 1000 sq ft roof = 623 gallons water
- 70-90% effective: 419–538 gallons
- Using three 90 gallon barrels: capture 55% of stormwater

But, remember it is only useful if regularly emptied before the next rain!

Rain Barrels

Make Your Own, Paint Your Own

How to Build and Install a Rain Barrel

TENNESSEE YARDS & NEIGHBORHOODS

INSTRUCTIONS

Before starting, clean your barrel; decide which downspout it will be attached to; purchase supplies and gather tools.

Read page 2 before beginning for some helpful hints to make installation easier.

DRILL HOLES

1. Spigot — use 1" speed bore bit to drill hole on "front" of barrel about 3" up from lower edge.
2. Overflow — use 1" speed bore bit to drill hole on "side" of barrel about 4" from upper edge.
3. Downspout — use 4" hole saw bit to drill hole on top of barrel over one of the existing holes.

INSERT HARDWARE

4. Screw in hose bib (spigot).
5. Insert the washer, then the bushing in the overflow hole from inside the barrel. The bushing threads will stick through the hole allowing the elbow to be screwed on. A socket wrench is useful for this step.

PREPARE FLEX-A-SPOUT (FAS)

6. Measure downspout to determine which end of FAS to cut off.
7. Cut off the other end of the FAS above the 'cut line' using a sharp utility knife.
8. Screw in sheet metal screws across from each other on the round end of the FAS.
9. Compress gutter strainer and insert into round end of the FAS and let it expand. The screws should hold the strainer in place.

INSTALL BARREL

10. Using shovel, set base of concrete block and level.
11. Set barrel on base.
12. Place strainer end of FAS into barrel.
13. Extend the FAS a small amount and mark the downspout where it needs to be cut.
14. Cut downspout using hacksaw.
15. Attach FAS according to directions that came with it.

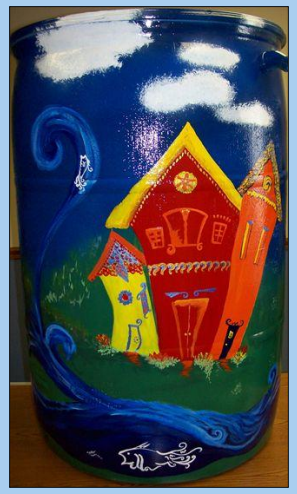
Supplies

- 1 - 55 gallon plastic drum (food grade)
- 1 - Flex-A-Spout
- 1 - Rigid Reducing Washer: 1 1/4" - 3/4"
- 1 - Hose Bib: 3/4" (spigot)
- 1 - 3/4" Galvanized 45° Street Elbow (overflow drain)
- 1 - Galvanized Bushing: 3/4" x 1/2"
- 2 - 6 x 12 Slot Zinc Hex Washer Head Sheet Metal Screws
- 1 - Expanded Aluminum Gutter Strainer (fits 4" round pipe)
- 2 - Concrete blocks

Tools

- 1/2" drill (corded is best)
- 4" Hole saw bit
- 1" Speed bore bit
- Small hex drive bit
- Socket wrench with 30 mm socket
- Thread dope or glue (optional)
- Utility knife
- Level
- Hacksaw
- Safety glasses
- Shovel

http://tnyardsandneighborhoods.tennessee.edu



Functional Art

Food-grade drum

Capacity: 55 gallons

Cost: $25 fixtures /barrel donated

Rain Barrels: Other Considerations

Water Quality

- Roof construction materials – no treated cedar shakes or materials containing asbestos
- Gutters– no lead solder or lead based paint
- Not for drinking, unless sanitized

Photo credits:
TOP: Architect: Bloodgood Architects & Planners, Inc. Photo: Mark Englund

Installment

- Consider your location
- Select your base (gravity fed)
- Ensure stability (55 gal of water = 456 lbs)

Grassed Lined Swales

- A gently sloping conveyance with a broad and flattened channel-bottom
- Easy to mow
- Increases infiltration

Rain Gardens

- Pocket-like planted depressions designed to capture rain water

- **Attractive landscape features**
- **Designed to reduce & slow down storm water runoff**
- **Can attract birds, butterflies & other wildlife**

Rain Gardens

Installation Steps & Costs

Installation

- I.D. location & determine size
- Test soil hydrology
- Evaluate soil & amend as needed
- Design & select plants
- Maintain

Costs

- $3 - $6 per $ft^{2:}$ – work by homeowner
- $10 - $15 per ft^2 – landscape designer

Burnsville, Minnesota, Barr Engineering Co.

Rain Gardens – Determine Location

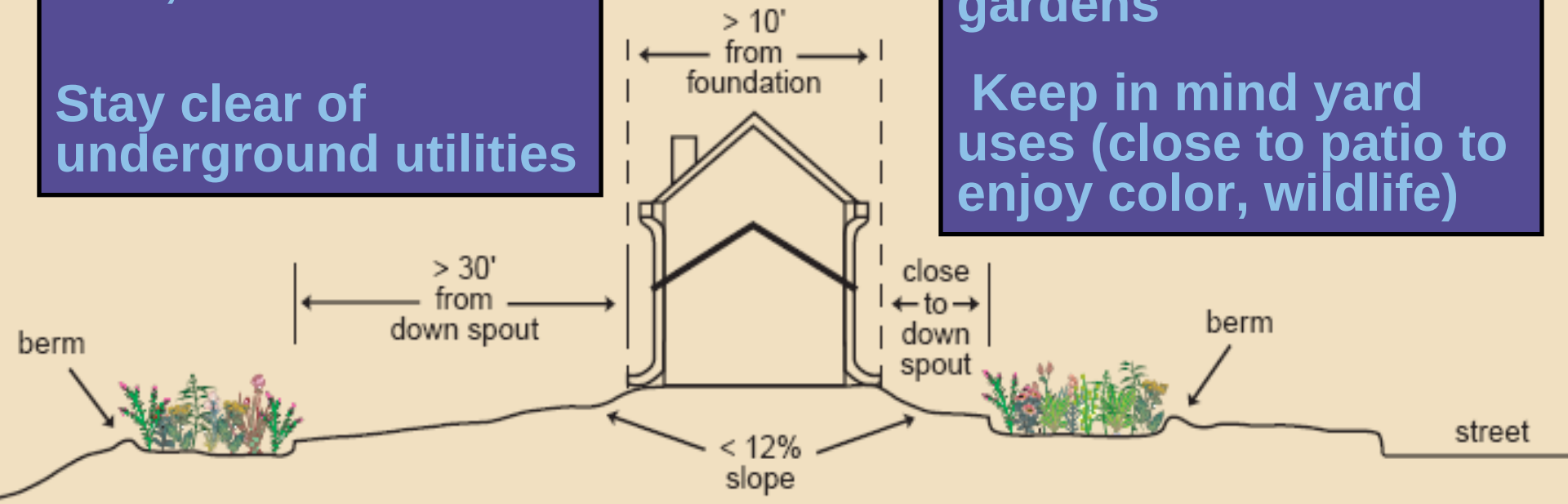
Keep at least 10’ from foundation & 25’ from septic drain field;

Stay clear of underground utilities

Observe rain water flow patterns in yard

Consider multiple gardens

Keep in mind yard uses (close to patio to enjoy color, wildlife)



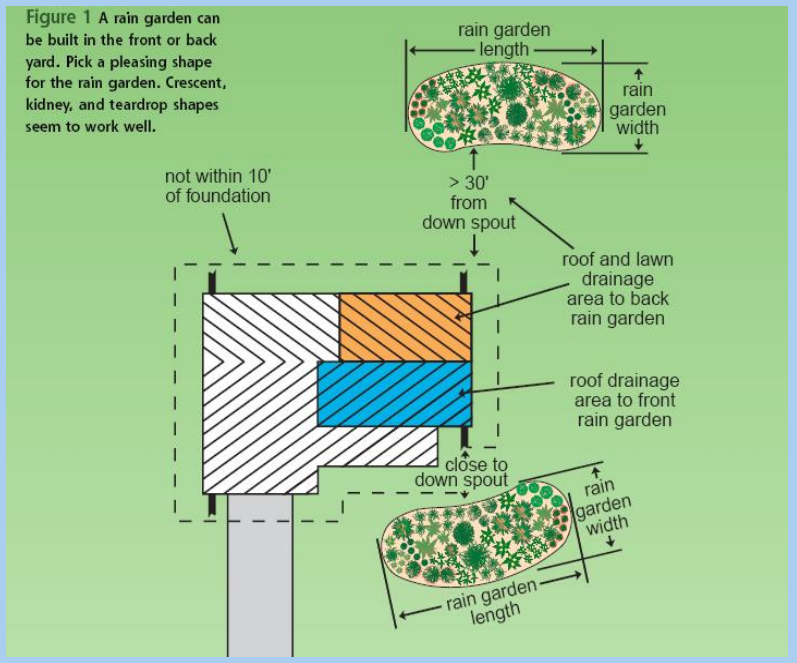
Avoid placing in area with standing water unless soils can be amended to infiltrate

Better to build in full or partial sun & avoid building under trees

Rain Gardens – Determine Size

- Designed to hold and absorb a one inch rainfall over 24 hours

- Based on the size of the area that drains to the rain garden
- Other considerations
  - runoff surface type (highly permeable or not)
  - Slope



Rain Gardens – Test Soil Hydrology

Construct in well-drained areas

Wetland Soil

"Perc" Test

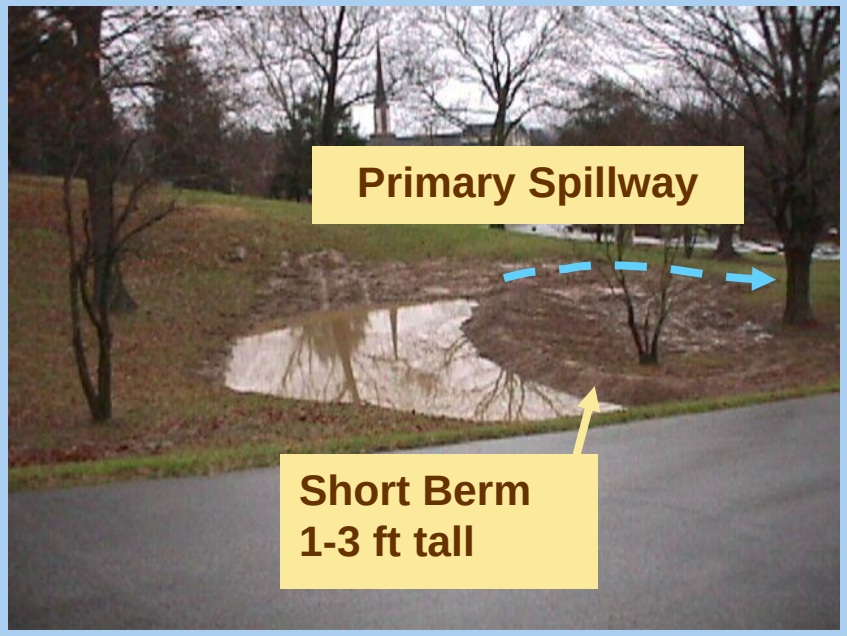
- Signs of Impermeable Soil
  - Ponds in area for several days after a storm event
  - Signs of wetland soil within 1' of surface (grey with streaks of brown)
- Test
  - Dig 8"x8" hole & fill with water
  - Monitor water infiltration – should go down at least 1" per hour

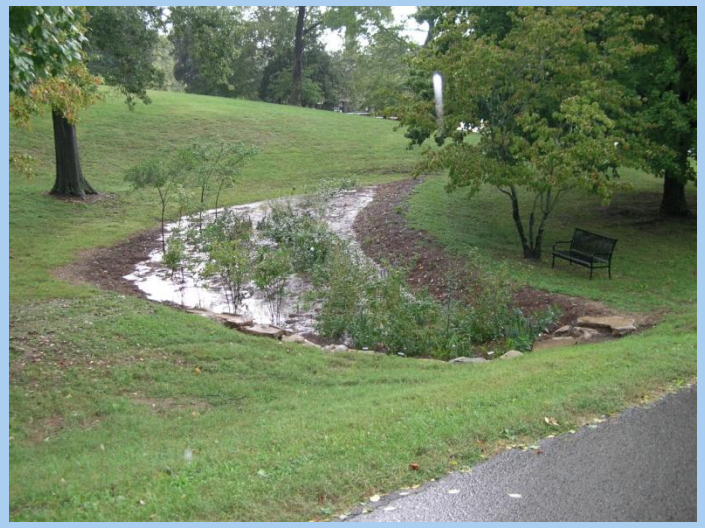
Rain Garden Examples

- **Water Source:** Parking lot & roof tops
- **Notable:** Mix of natives with natives

- **Water Source:** **Parking lot, AC from building, roof top**
- **Notable:** **More engineered for functional purposes; overflow outlets**

Rain Garden Examples





- **Water Source:** Parking lot & upland lawn
- **Capacity:** 1350 ft^3 (10,098 Gallons)

Waterbody Buffers

Mix of trees, shrubs, and grasses adjacent to water's edge

Approach

- **At minimum a 25 - 50 ft "no fertilizer, no pesticide" zone**
- **The wider & more diverse in plants, the more functional**

Functions

- **Reduces bank erosion**
- **Filters out pollutants**
- **Creates wildlife habitat**
- **Lowers water temperatures**

Streamside Buffers - Planting

Privet

Bush Honeysuckle

- Evaluate removing exotic invasive species & consider replacing with natives
- Assess bank instability issues – may need to leave root systems
- ID best planting time & the “right plant” for this place
- Check with local water resource agencies & associations for guidance and possible resources

Waterbody Buffers

Riparian Plant Shrub Examples

Virginia Sweetspire: 3” - 6”

Summersweet: 4” – 9”

Fothergilla: 3” – 6”

Red Osier Dogwood:

12” – 18”

Home Stormwater Strategies