

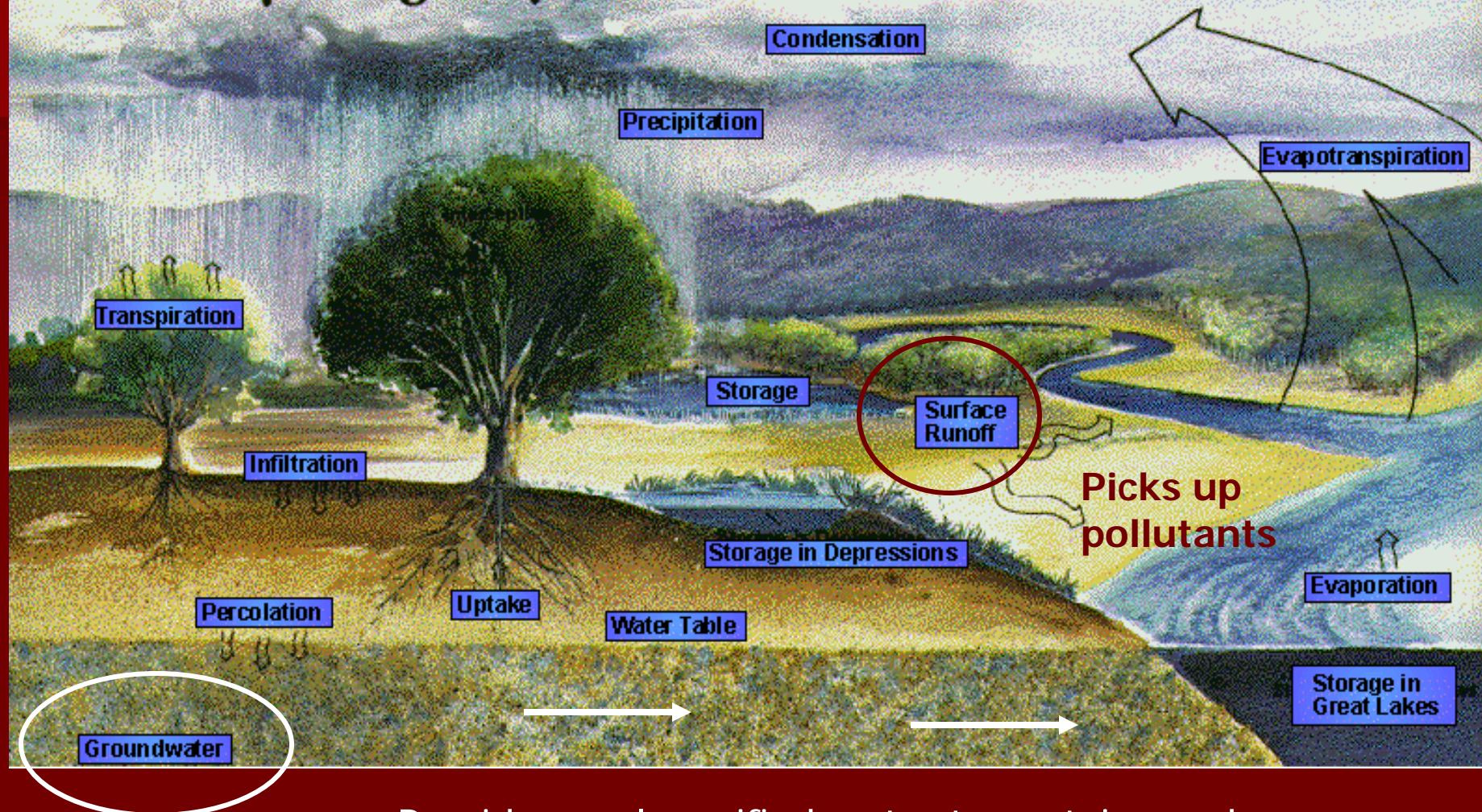
# Managing Stormwater Runoff



*Controlling  
Stormwater  
at Home*

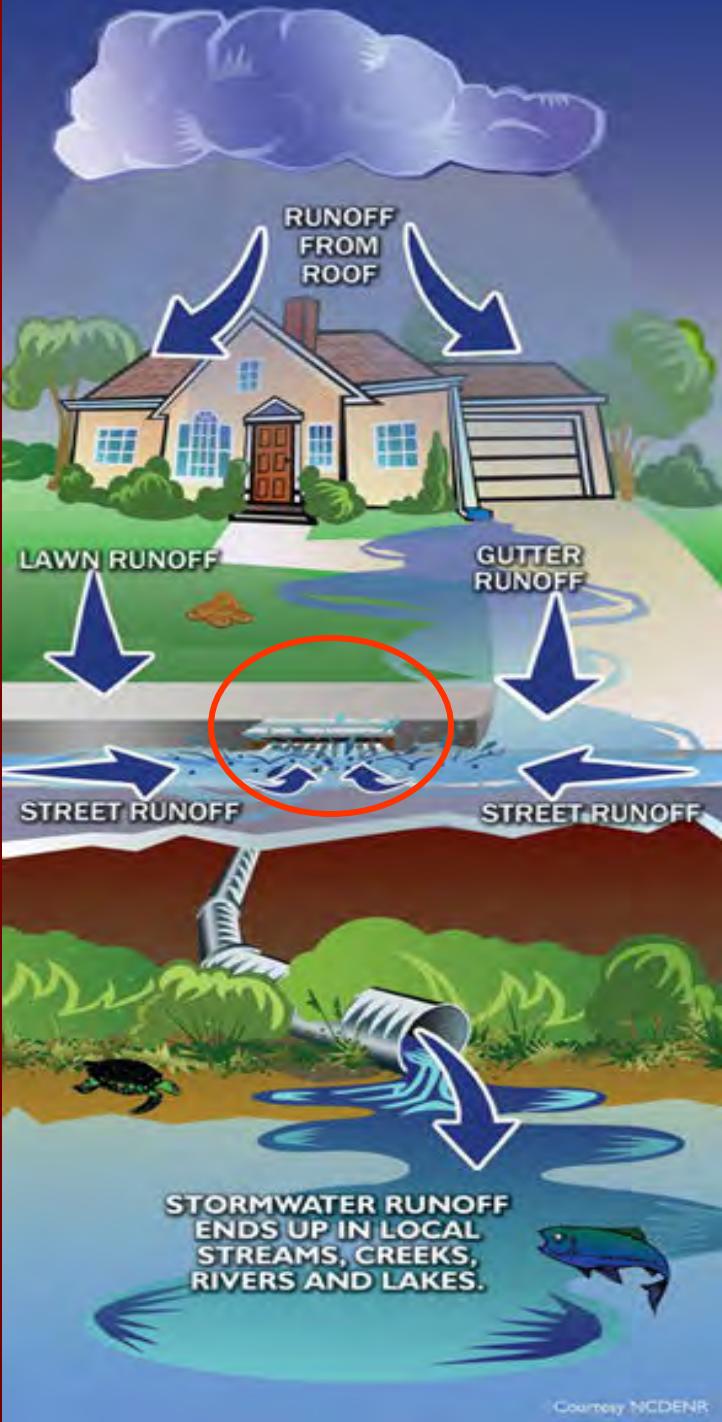
# The Hydrologic Cycle

Get Water Back In the Ground



Provides cool, purified water to sustain creeks

# Pollutants Carried by Runoff to Stream



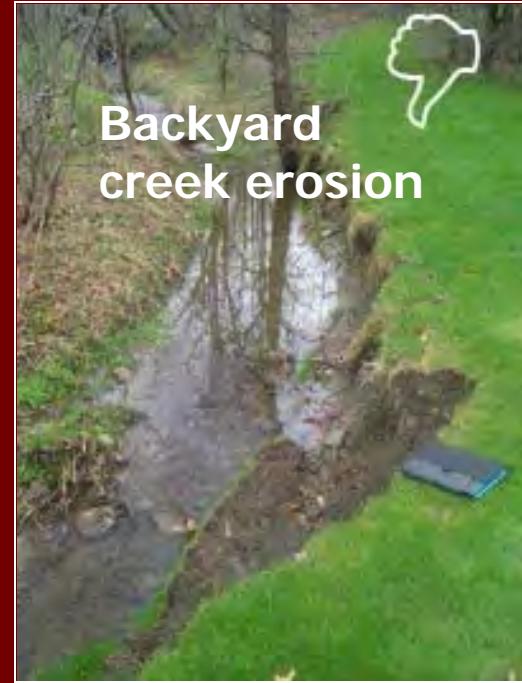
- Sediment from exposed soil
- Excess pesticides, fertilizers
- Trash and debris on roadways
- Oil, auto fluids and soapy water
- Pet waste left on the ground
- Salt from road treatments
- Yard Waste – grass and leaves

*Storm sewers vs. sanitary sewers?*



Gutter  
drainage

## Backyard Runoff Problems



Backyard  
creek erosion



Drainage from neighbor



Drainage  
erosion



Neighbor has  
higher elevation



Less sewers, less curbs, less hard surfaces, less runoff.

More green space, more swales, more natural features, more native vegetation.

# Techniques to **STOP** or **Slow** Runoff



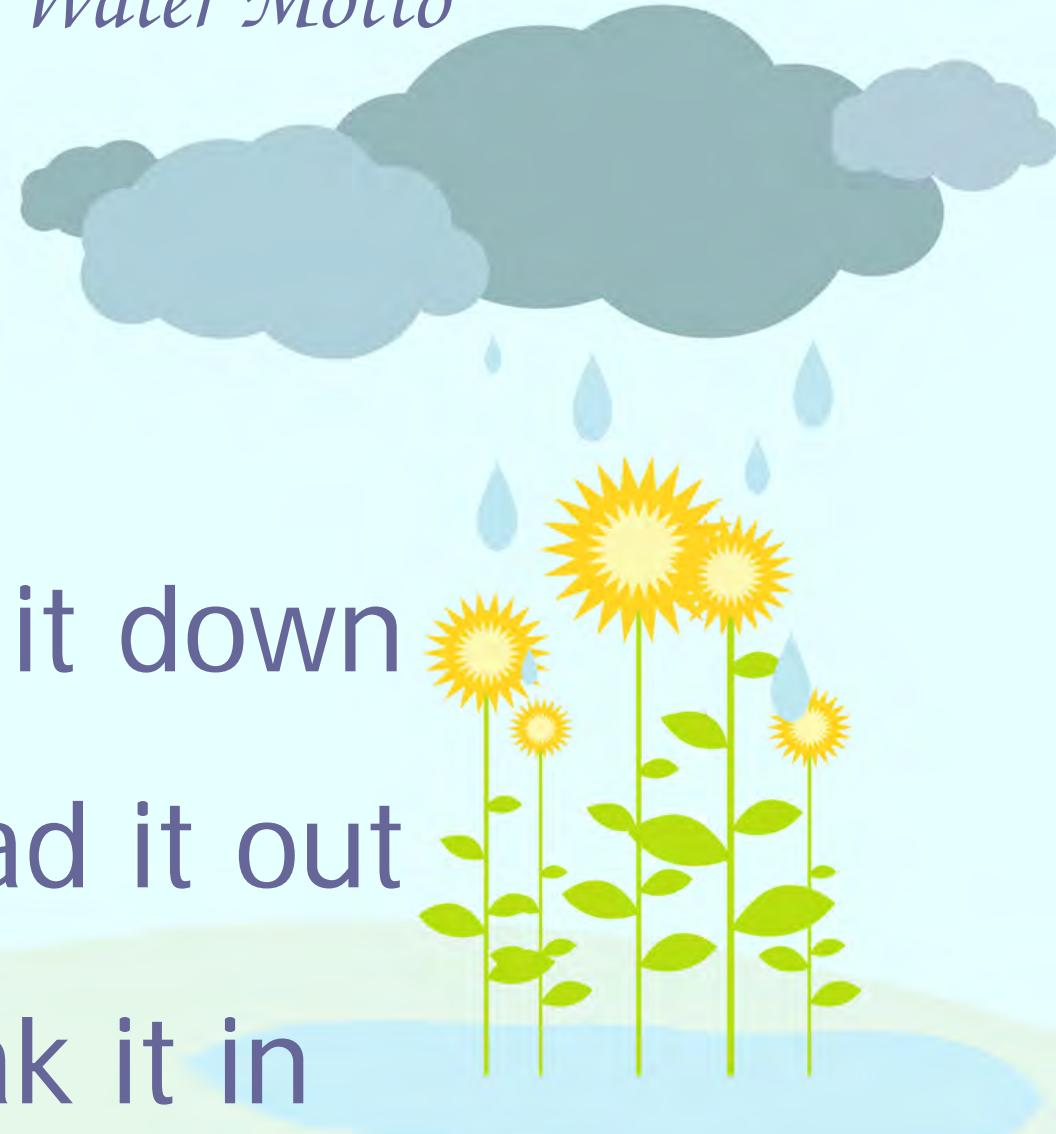
- Rain Gardens (Bioretention)
- Conservation Landscaping with Native Plants
- Soil Amendments
- Tree Canopy
- Gutter Runoff
- Pervious Pavement
- Rain Barrels
- Cisterns
- Dry Wells
- Rockscaping
- Swales/Berms
- Check Dams
- Bump-Outs
- Streambank Stabilization

## *Storm Water Motto*

Slow it down

Spread it out

Soak it in

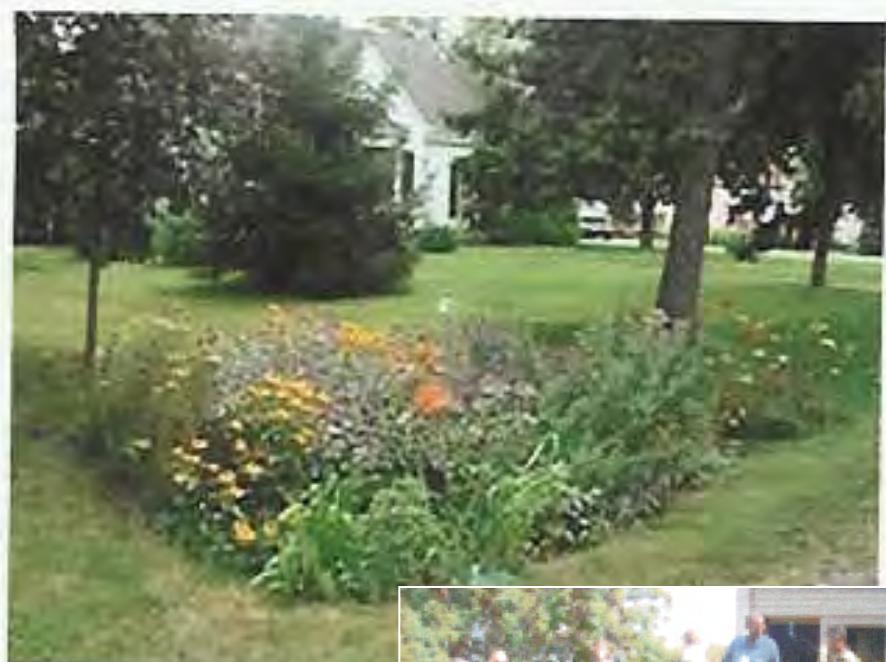
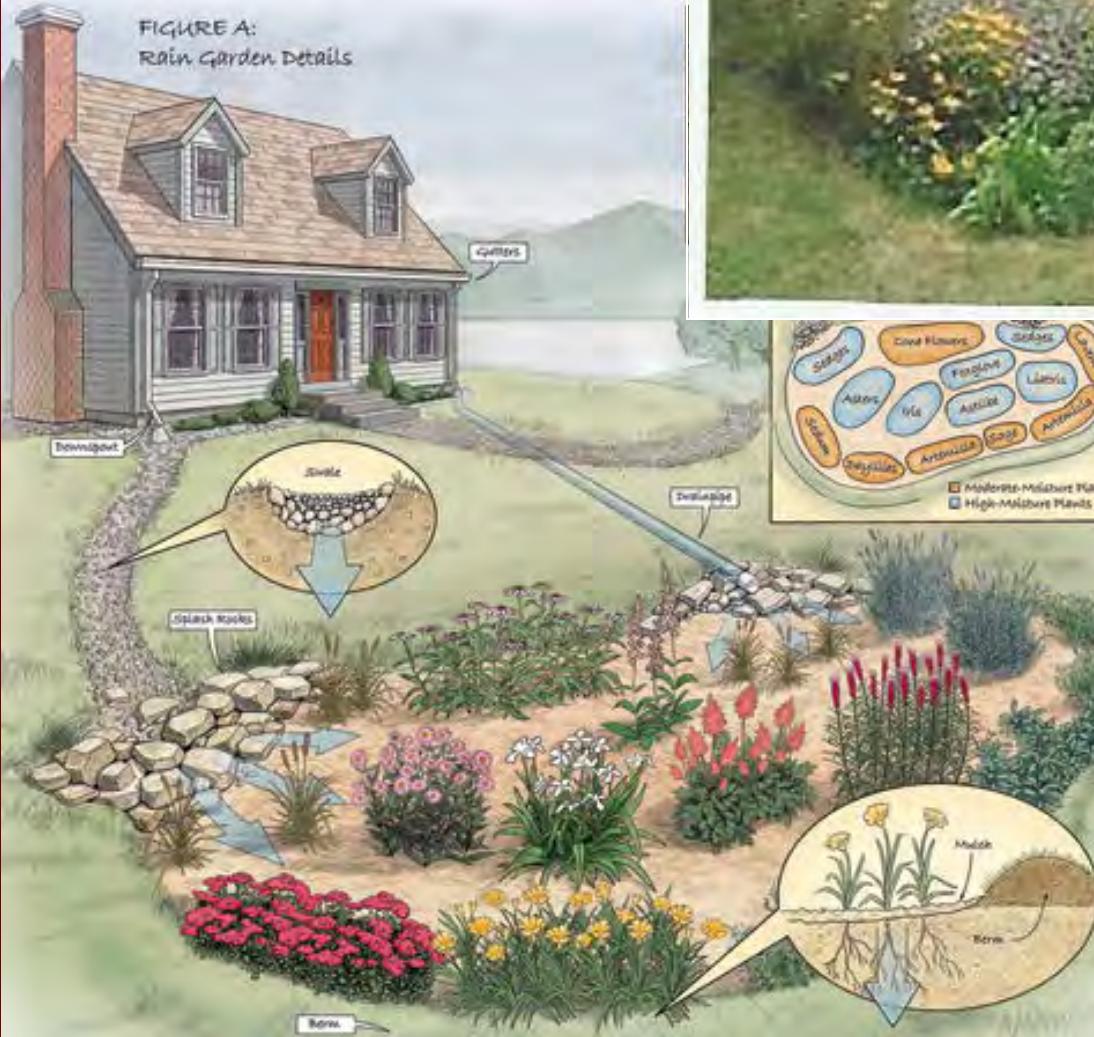


# Advantages of Techniques

- Captures stormwater runoff close to the source.
- Slows down the rate of runoff.
- Reduces the overall volume of runoff.
- Provides filtration to remove pollutants from stormwater runoff.
- Provides an opportunity for stormwater to soak into the ground, replenishing ground water.

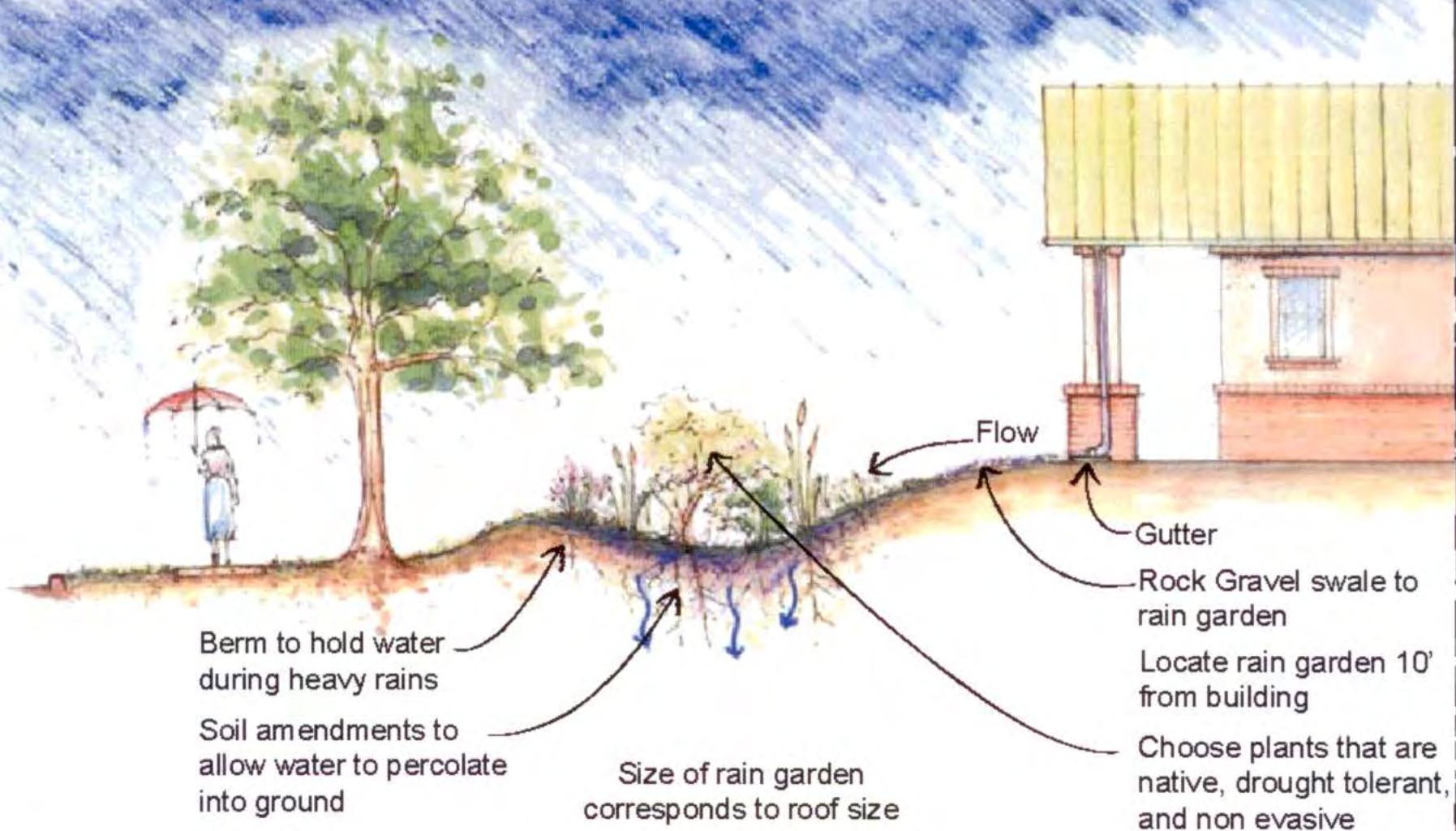
# 1. Rain Gardens

FIGURE A:  
Rain Garden Details

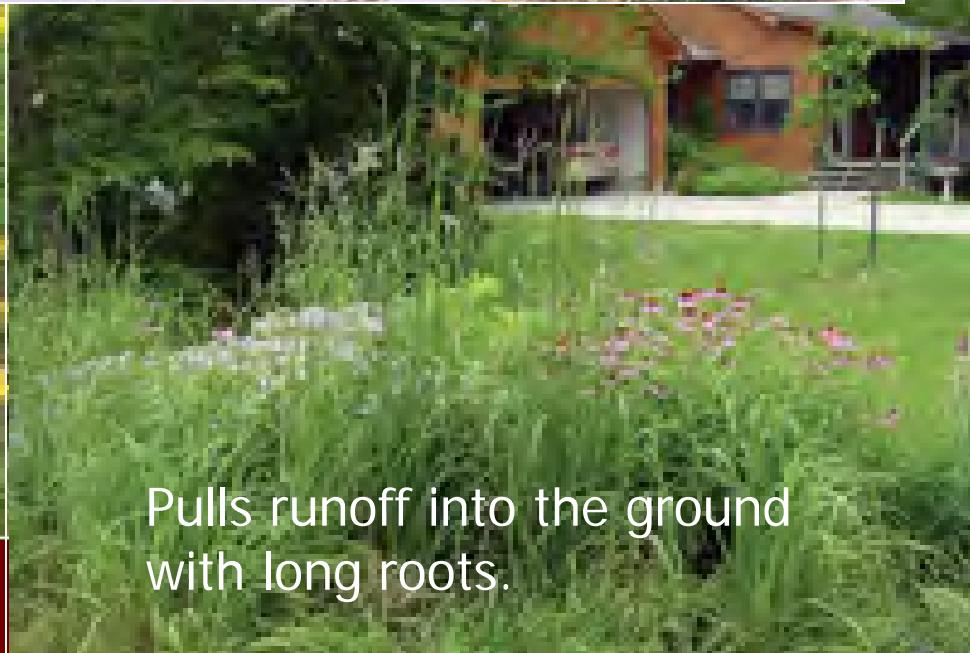


# Bioretention

# How a Rain Garden Works



## 2. Conservation Landscaping with Native Plants



Pulls runoff into the ground  
with long roots.

# Advantage of Native Plants



Long roots pull water down from the surface and get the water back into the ground as groundwater to replenish and purify the water supply.



### 3. Soil Amendments

- Mass grading during construction leaves little or no top-soil
- Compacted soil hard as concrete and not permeable to rain
- Test: soil nutrients, organic content and compaction

Amend soil to make it nutrient rich and permeable to stormwater:

Mix existing soil with organic material such as compost, sphagnum moss, (peat moss) leaves, sand, and top soil or soil mix.

# 4. Tree Canopy



Trees provide shade and cools. Helps save on home energy costs.

Trees provide a leafy cover on ground to get water into the ground and transpiration gets water into the air.

Reduces wind and erosion.

Increases property values.

# Good Yard Trees

## Trees For Large Yards

- Red Maple
- Yellow Poplar or Tulip tree
- Red and White Oak
- Sycamore
- American Elm
- River birch
- Redbud
- Conifers (Pine, Spruce)



## Trees For Small Yards

- Amur Maple
- Crabapple
- Redbud
- Flowering Dogwood
- Chinese Dogwood
- Serviceberry

## 5. Gutter Runoff



# Gutter Runoff



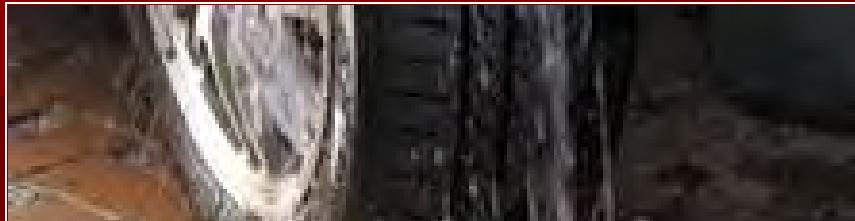
# 6. Pervious Pavement



Grass Pavers



# Pervious Pavers



Porous infiltration

Driveway consists of three layers. The bottom layer is gravel, the middle is leveling layer, top is pervious pavers.

# 7. Rain Barrels



Downspout Disconnect



Provide small amount of storage for runoff from the roof.

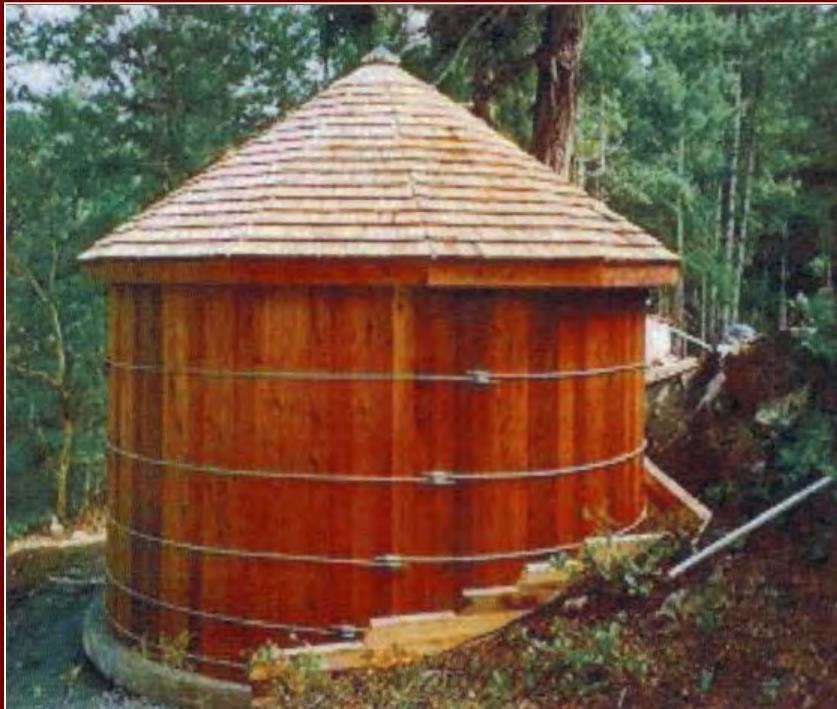
Good option if downspouts discharge to a driveway or sidewalk.

Use stored water to water plants in summer or slowly release water to grassy area.

# 8. Cisterns

Cistern should capture about 250 gallons of runoff.

Need adequate area to empty it.



# 9. Dry Wells

Good option when space is limited because they are built underground.

They require soils that drain well.

They are more expensive.



# Dry Well

Stores stormwater. The punch-out holes release water into the substrate.



**Punch-out  
holes**

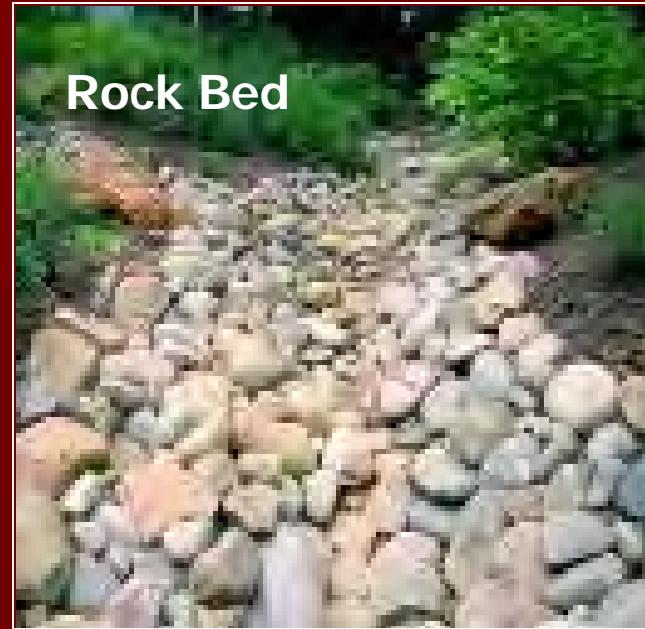


Underground piping from  
gutter

# 10. Rockscaping



Dry Creek Bed



Rock Bed



Waterfall

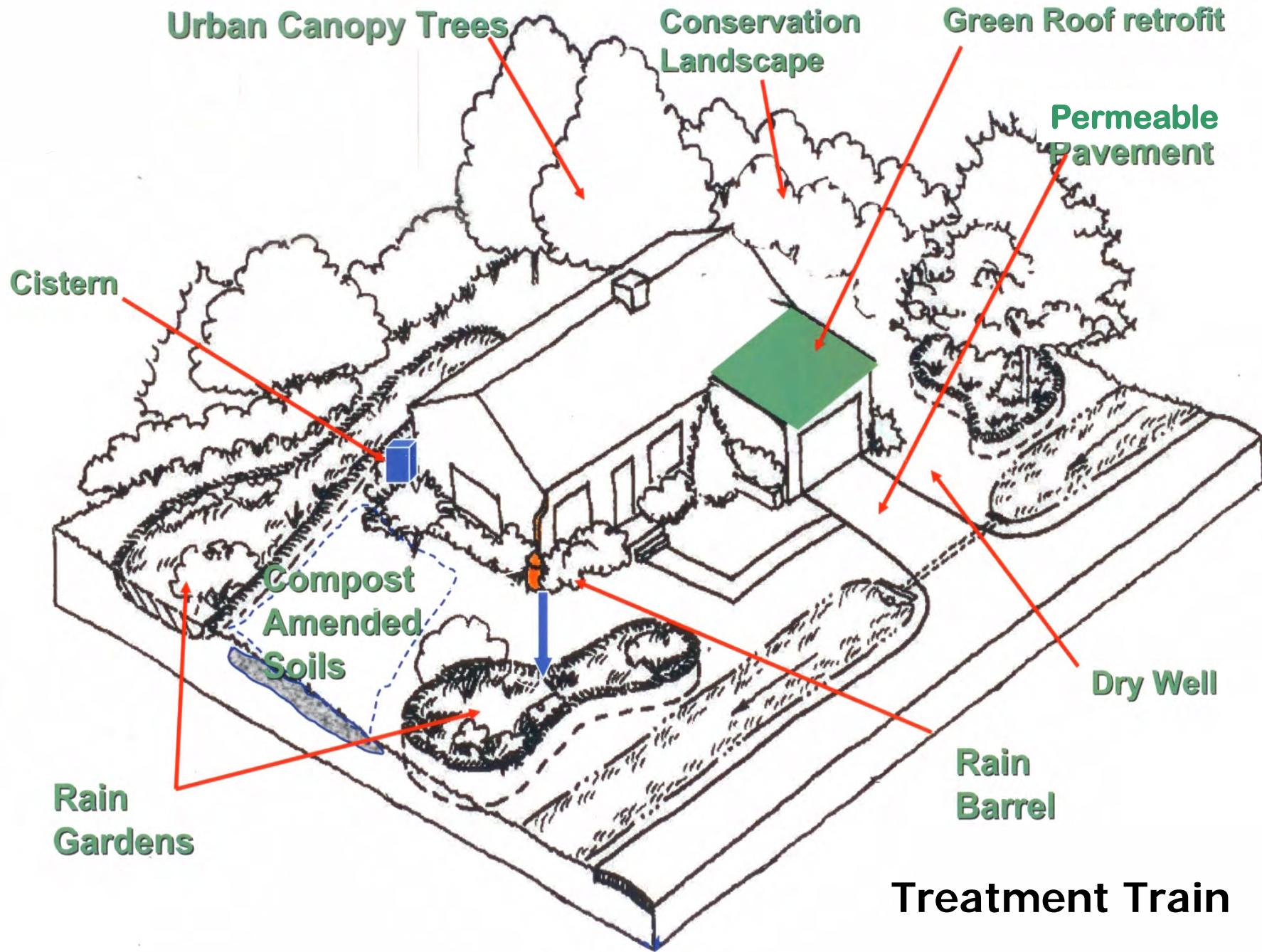
If water is causing erosion or pooling water, consider installing a dry creek bed. The purpose is to artfully redirect water away from problem areas.

# 11. Swales

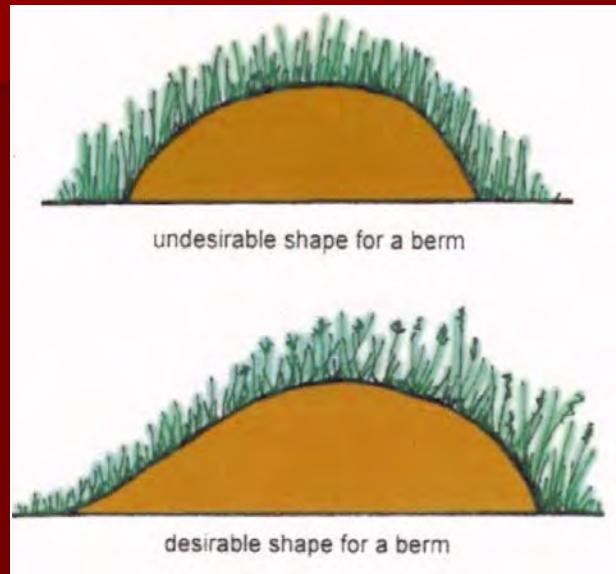


Concave depression that drains water safely.

Allows water to penetrate the ground.



# 12. Berms

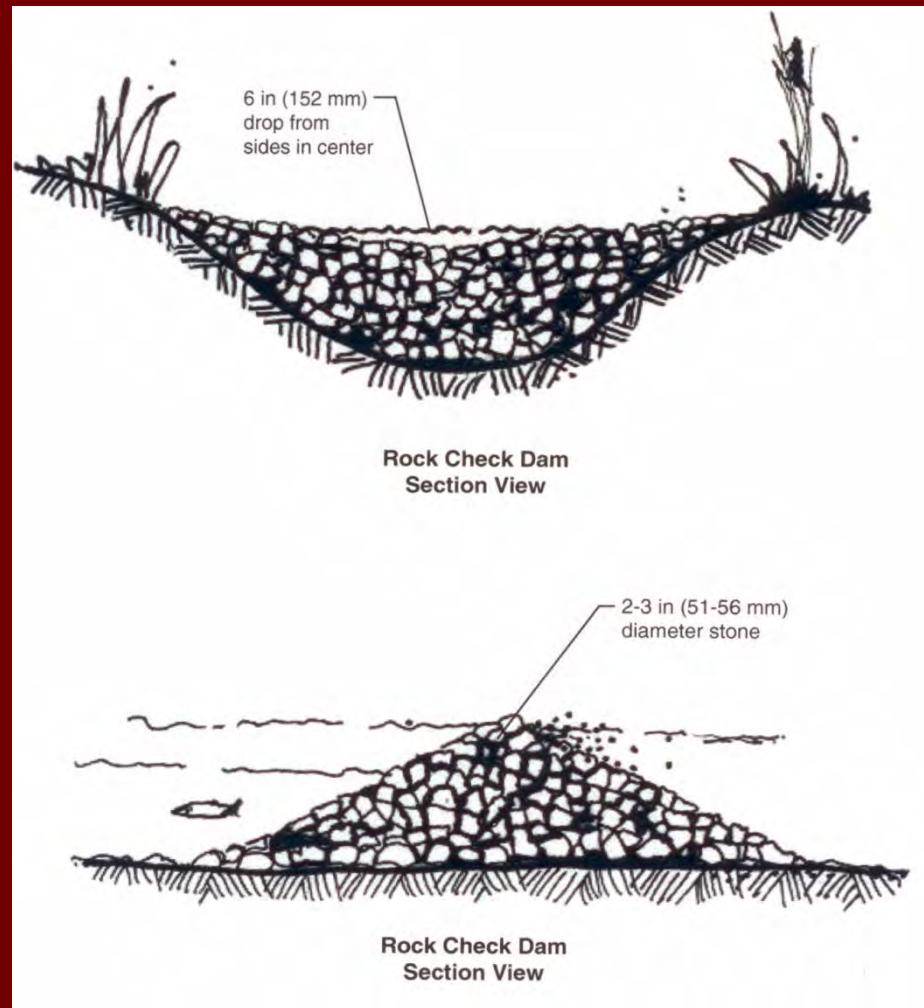


Berms are usually located on gently sloping sites. To prevent stormwater flows, berms are used to create "lips" in yard areas where temporary retention of stormwater does not interfere with use.



# 13. Check Dams

Reduces erosion and gullying by slowing the velocity of runoff. Can be used where it is not possible to divert flow and stabilize the channel.



# 14. Vegetated Bump-Out

A vegetated curb extension consists of two layers: gravel at the bottom and plant growth at the top. It is designed to intercept water flow and removing the volume through infiltration.



# Erosion Creekside



Before

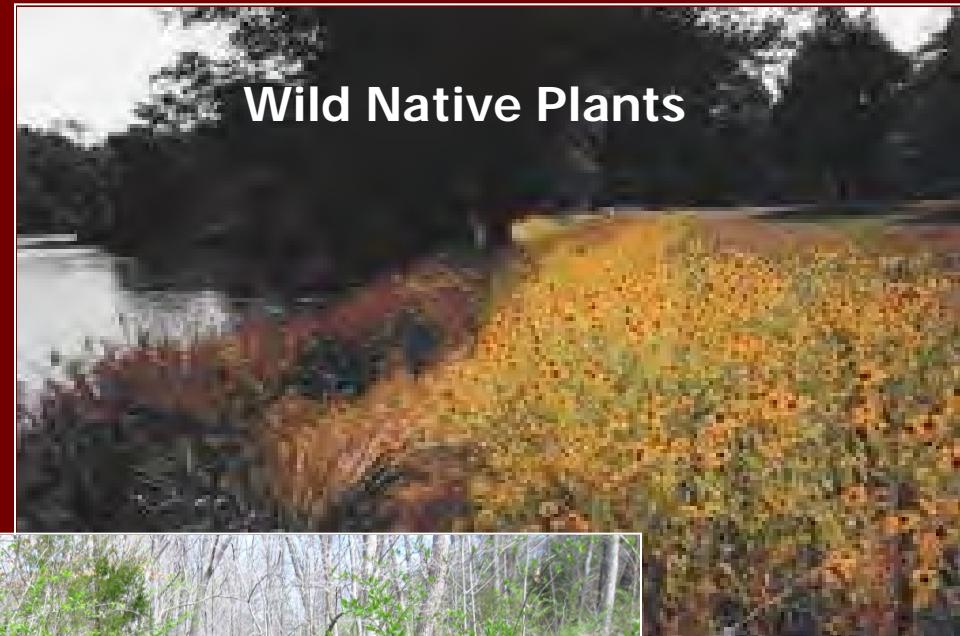


After

# Back Yard Creek Bank Stabilization



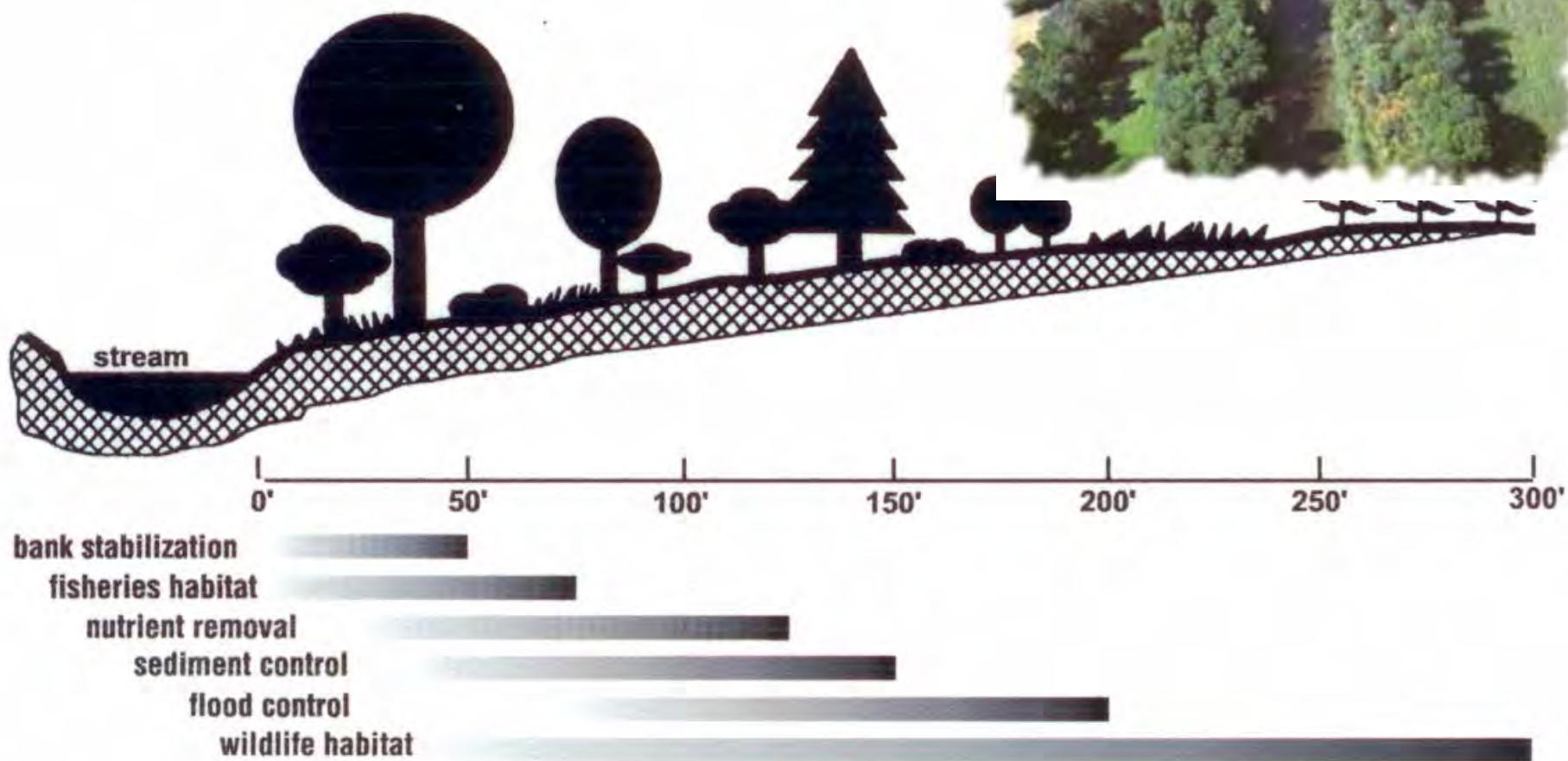
Natural Buffer

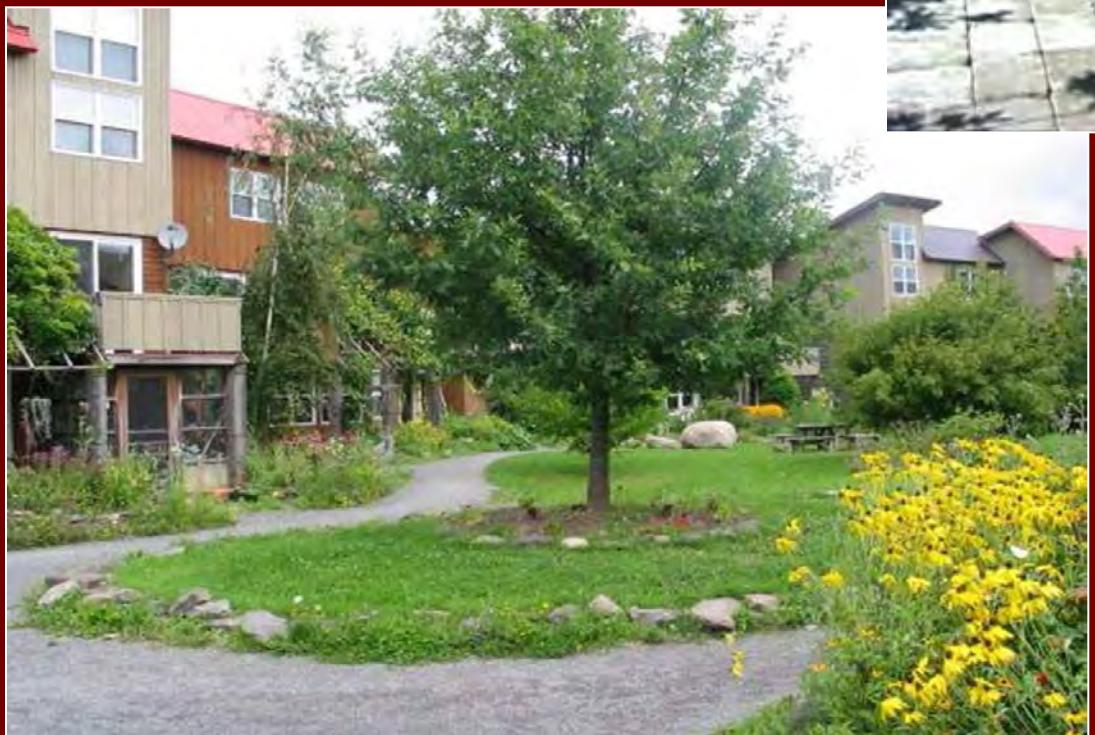


Wild Native Plants



# Benefits of Stream Buffer





# The Landscape

# Neighbor To Neighbor



- Distribute directories for recycling centers
- Provide list of safe car washing products
- Provide information on proper disposal of hazardous waste products
- Offer technical assistance to route gutter runoff to gardens or landscaped areas
- Offer homeowner pollution practice recognition

# Neighbor To Neighbor



- Promote demonstration lawn & garden programs
- Offer assistance in yard waste composting
- Offer tree planting assistance
- Promote backyard habitat gardens
- Provide regular yard waste pickup
- Provide fall leaf pickup
- Promote soil tests before fertilizing

# Additional Information

- ❖ Applied Ecological Services, Inc.
- ❖ [www.appliedeco.com/RainGarden.cfm](http://www.appliedeco.com/RainGarden.cfm)
- ❖ Rainscapes:  
[www.montgomerycountymd.gov/dectmpl.asp?url=content/dep/water/rainscapes.asp](http://www.montgomerycountymd.gov/dectmpl.asp?url=content/dep/water/rainscapes.asp)
- ❖ grownative.org (buyers guide for native plants)
- ❖ mdc.mo.gov (seedling orders Nov thru April)
- ❖ missouriplants.com
- ❖ mowildflowers.net
- ❖ <http://extension.missouri.edu/jefferson>