# RainScape Rebates Program

## Round 3 2014

Deer Creek Watershed Alliance

a project of

Missouri Botanical Garden

***The RainScape Rebates program is funded by:***

- *Great Rivers Greenway*
- *Mabel Dorn Reeder Foundation*
- *Metropolitan St. Louis Sewer District*
- *Missouri Department of Conservation*
- *Participating municipalities*
- *US EPA Region 7 through the Missouri Department of Natural Resources (subgrant number G11-NPS-15, under Section 319 of the Clean Water Act*

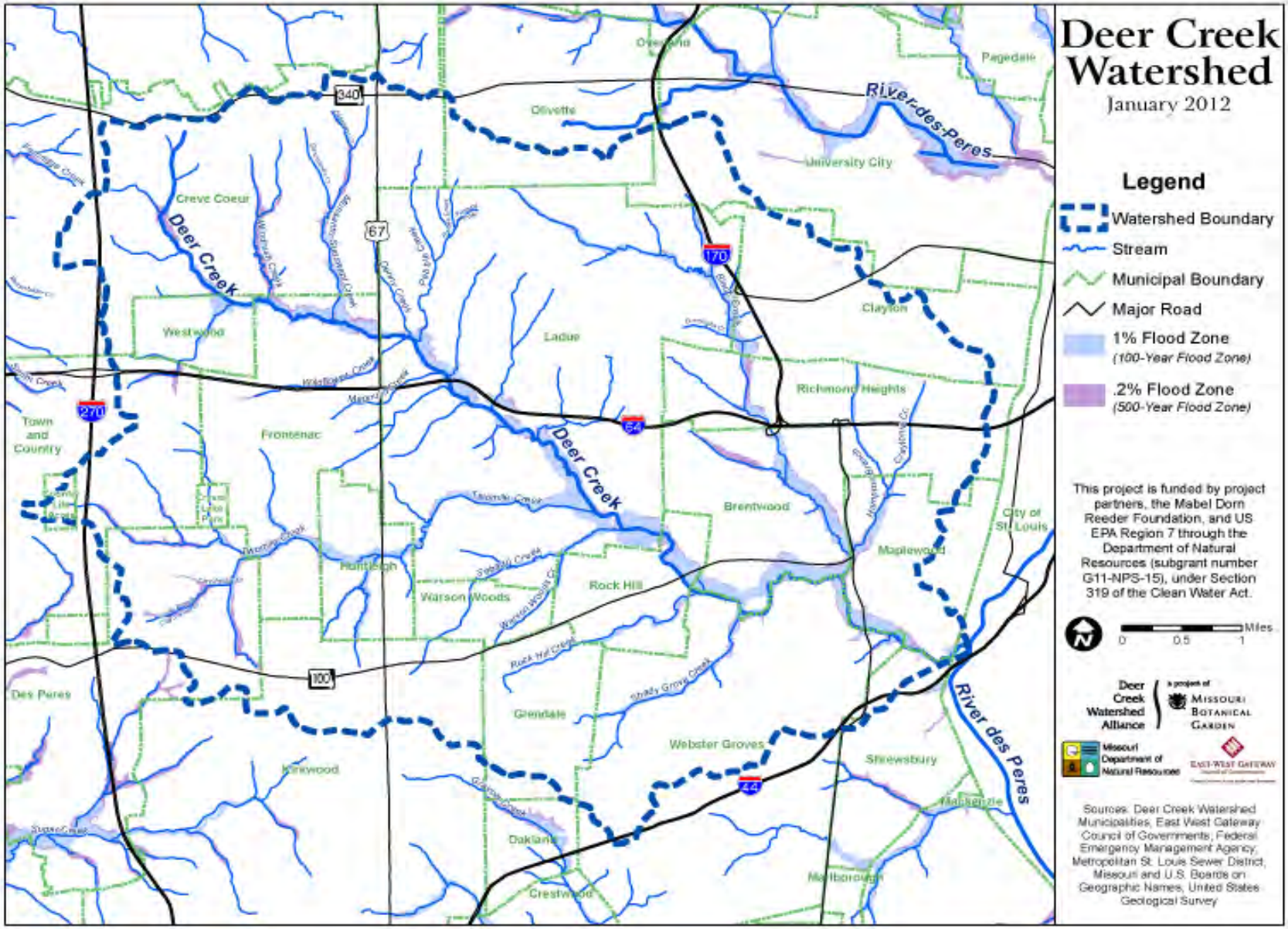
*Download Application PDF*

deercreekalliance.org

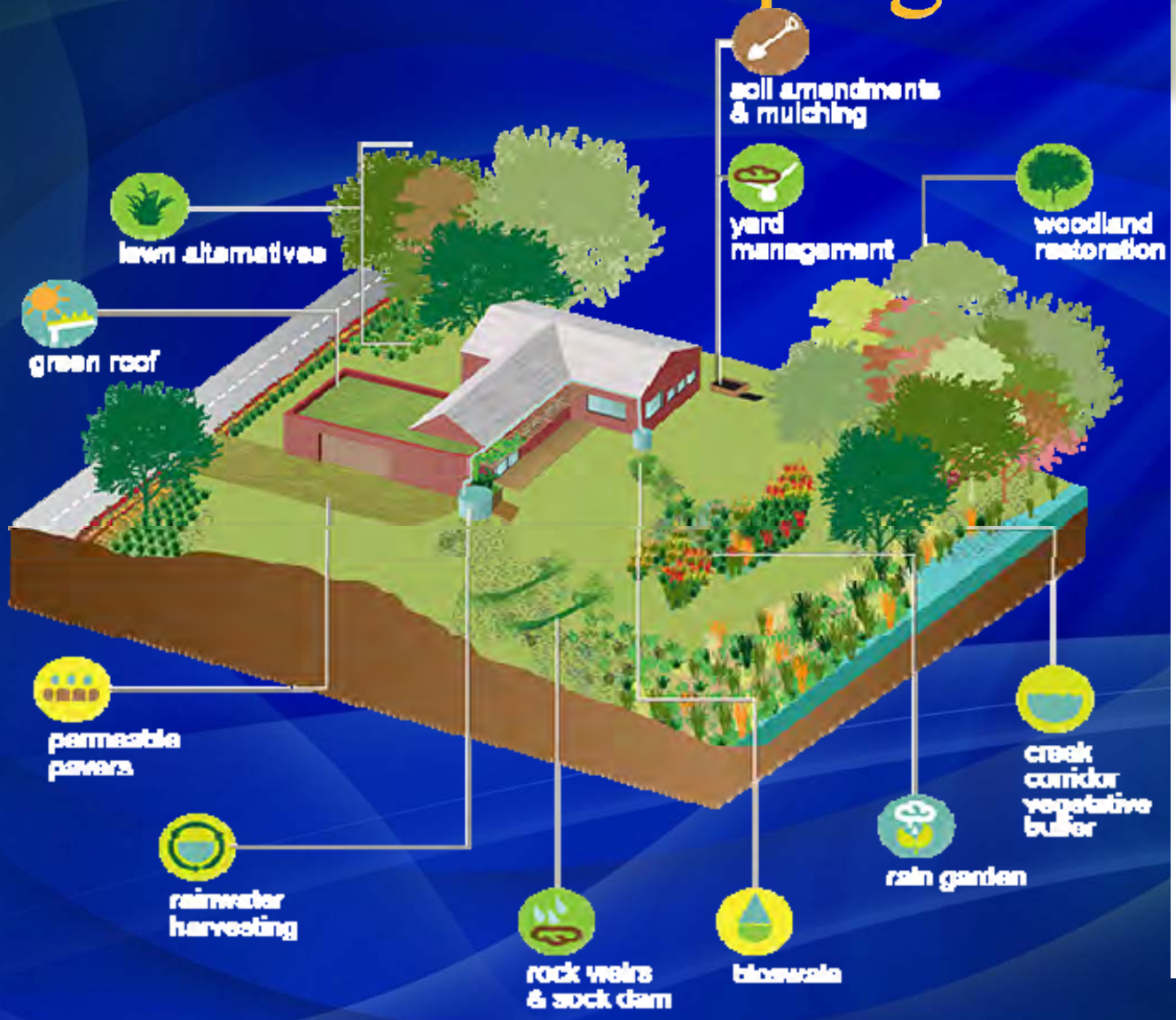
**online resource:**

*RainScaping Guide*

mobot.org/rainscaping


Deer Creek Watershed
January 2012
Legend
Watershed Boundary
Stream
Municipal Boundary
Major Road
1% Flood Zone
(100-Year Flood Zone)
.2% Flood Zone
(500-Year Flood Zone)
This project is funded by project partners, the Mabel Dorn Reeder Foundation, and US EPA Region 7 through the Department of Natural Resources (subgrant number G11-NPS-15), under Section 319 of the Clean Water Act.
Miles
0
0.5
1
Deer Creek Watershed Alliance
a project of Missouri Botanical Garden
Missouri Department of Natural Resources
East-West Gateway
Sources: Deer Creek Watershed Municipalities, East West Gateway Council of Governments, Federal Emergency Management Agency, Metropolitan St. Louis Sewer District, Missouri and U.S. Boards on Geographic Names, United States Geological Survey
River des Peres
Deer Creek
Creve Coeur
Olivette
University City
Pagedale
Clayton
Ladue
Westwood
Frontenac
Town and Country
Richmond Heights
Brentwood
City of St. Louis
Maplewood
Rock Hill
Warson Woods
Huntleigh
Des Peres
Grendale
Webster Groves
Shrewsbury
Kirkwood
Oakland
Crestwood
Mackenzie
Marlborough
340
67
270
170
64
100
44

# What is RainScaping?




## RainScaping Quick Links




*The Missouri Botanical Garden RainScaping Guide is partially funded by the Mabel Dorn Reeder Foundation and US EPA Region 7 through the Department of Natural Resources (subgrant number G11-NPS-15), under Section 319 of the Clean Water Act.*

# Why RainScape?

**Funder/Program Design Goals:**

Clean Water Act 1972 – to attain clean water that is fishable and swimmable

# Goals and Benefits:

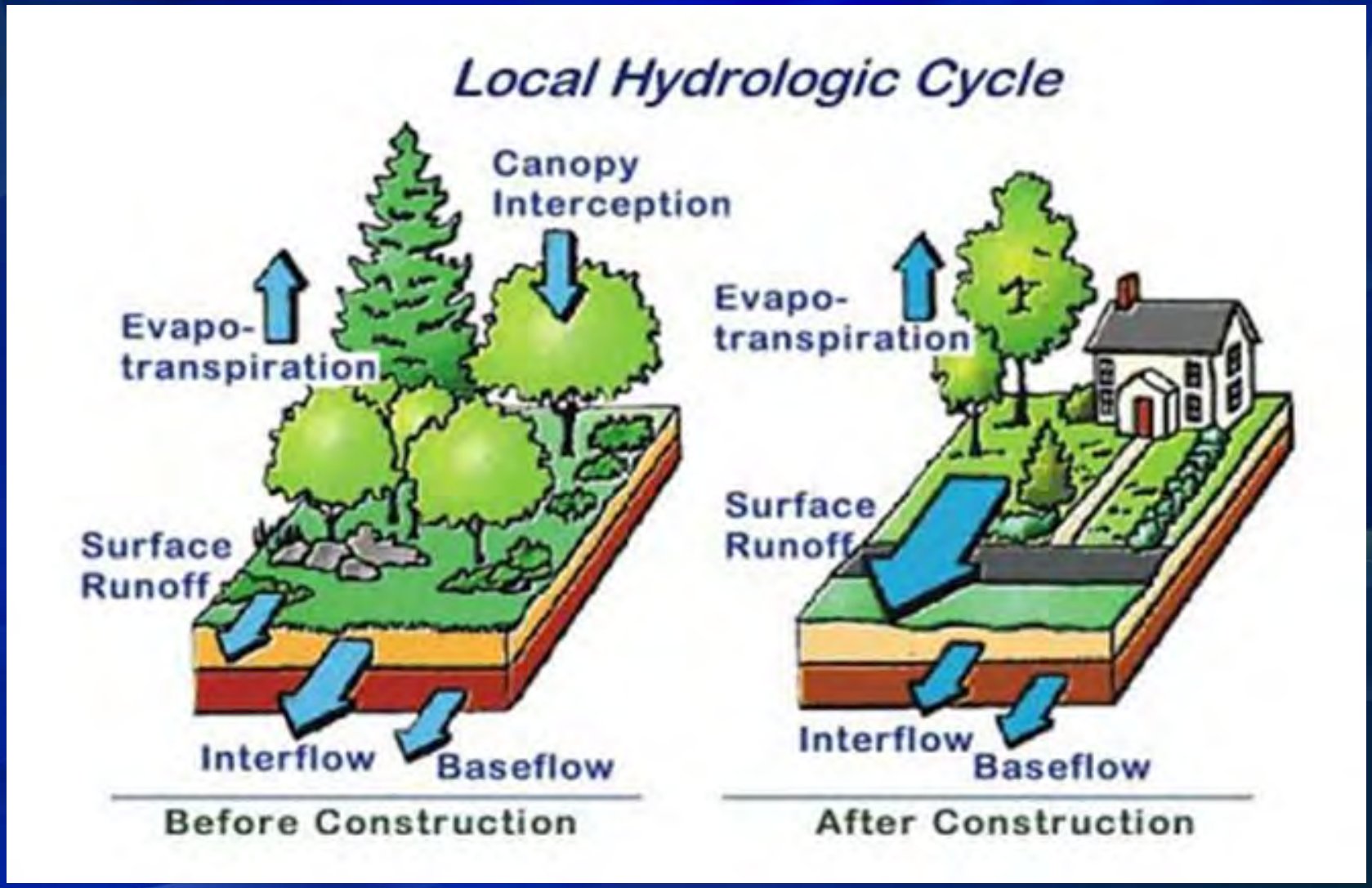
## Improve water quality:

- Reduce volume and velocity of runoff
- Reduce pollutants –remove them at the source
- Reduce property damage due to erosion & flash flooding
- Restore % of pre-development hydrology

## Extra benefits:

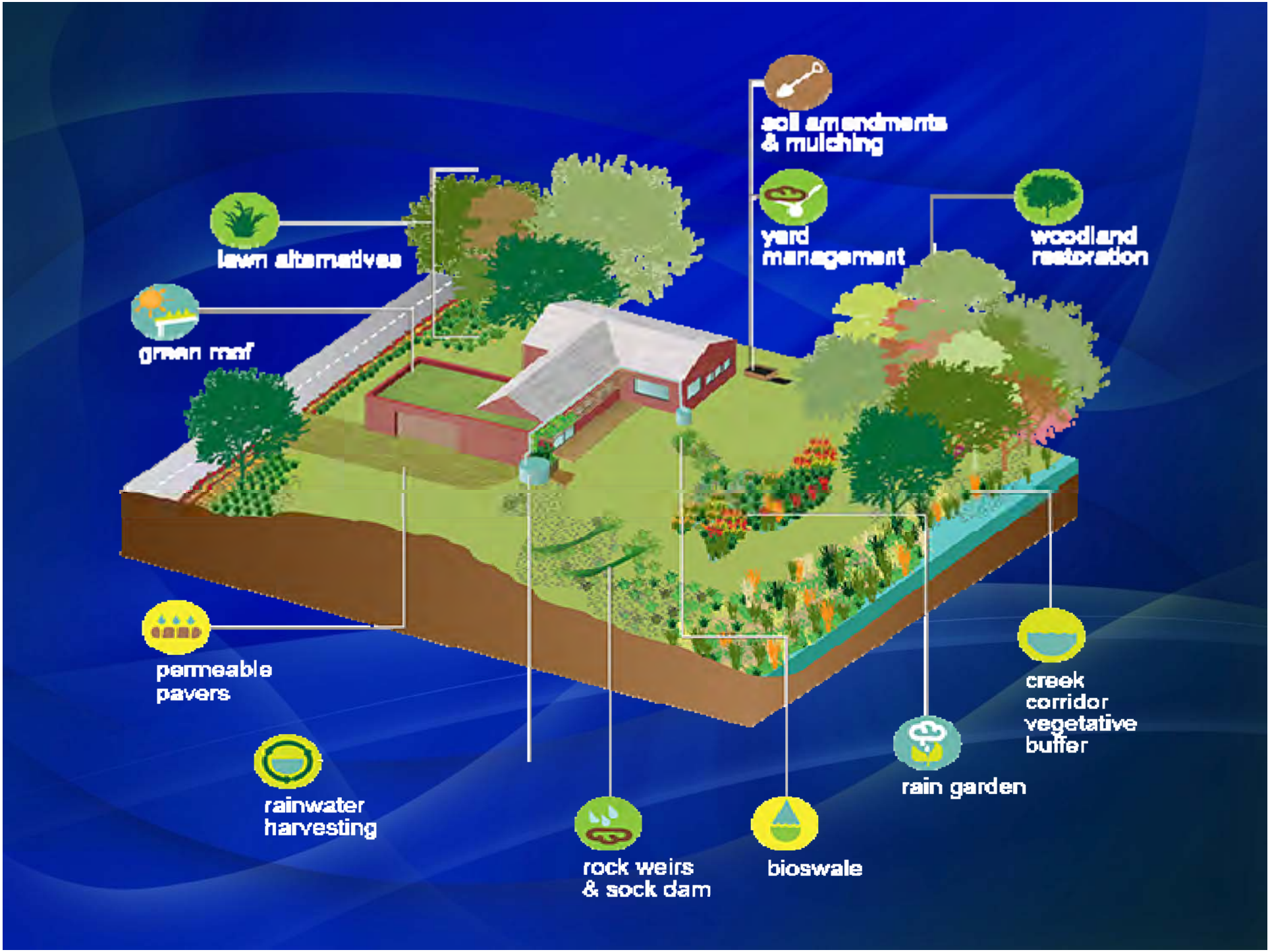
- Create sustainable solutions using plant-based options
- Increase regional biodiversity
- Provide educational opportunities to encourage good stewardship of resources

# Capture Water Onsite



# Landowner Design Goals

- Solve landscape problems
- Increase biodiversity & wildlife habitat
- Increase property values/aesthetic addition
- Contribute towards clean water
- Conserve soil
- Save energy
- Enhance mental well-being
- Reduce watering needs
- Reduce air pollution
- Provide educational opportunities


soil amendments & mulching
lawn alternatives
yard management
woodland restoration
green roof
permeable pavers
creek corridor vegetative buffer
rainwater harvesting
rain garden
rock weirs & sock dam
bioswale

# RainScaping Guide: Soil Amendments & Mulching

## Amending Soil to Improve Infiltration Rates

Incorporating compost-amended topsoil, well-aged compost, calcined clay and/or expanded shale, are recommended strategies for improving soil infiltration rates. In addition, topping the garden with annual application of organic mulch is a key ingredient for reducing compaction and improving soil quality and infiltration capacity. This will, in turn, improve plant growth and root systems which increase the ability of the soil to absorb water over time.

Adding sand in insufficient quantities can result in a concrete-like soil texture that does not drain; therefore adding sand is NOT recommended.

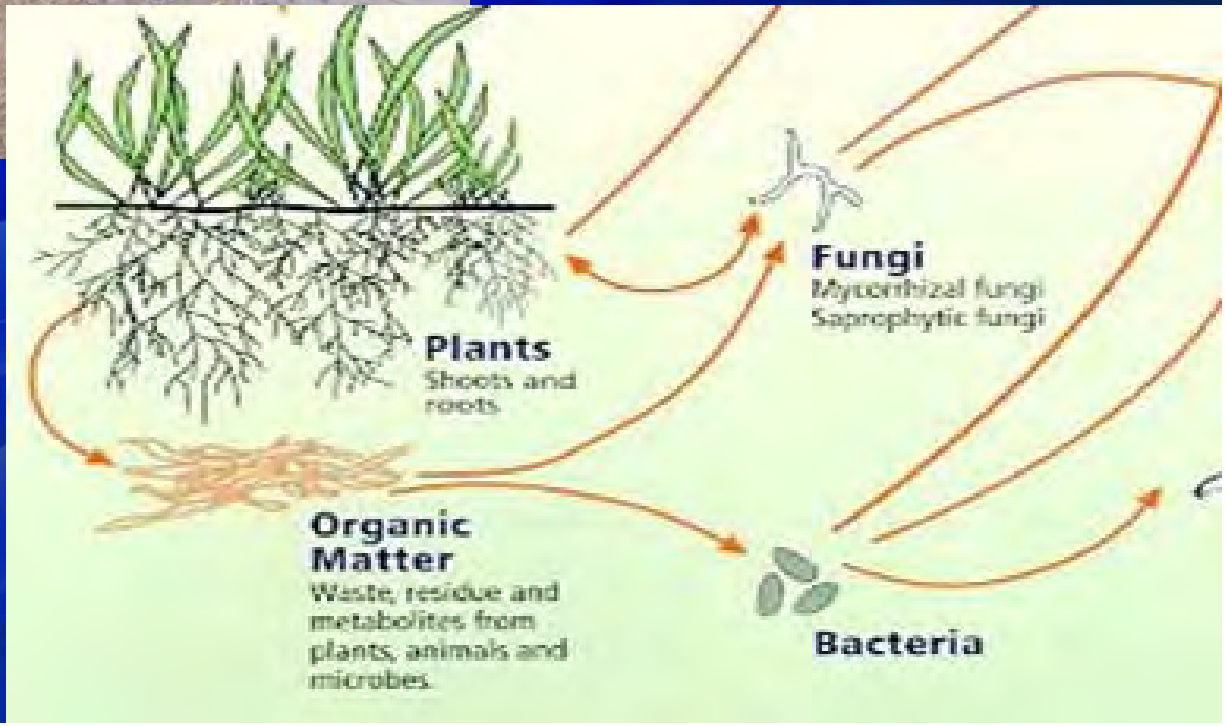
For more detailed soil amendment and mulching recommendations see Conquer Compacted Soils.

For guidance on fertilizing your yard see Fertilizer Management.

**DO NOT add sand to native soil to improve permeability = sand + clay + lime = bricks**

# Soil is Nature's Pipeline

## Healthy organic topsoil is more permeable



# RainScaping Guide: Lawn Alternatives

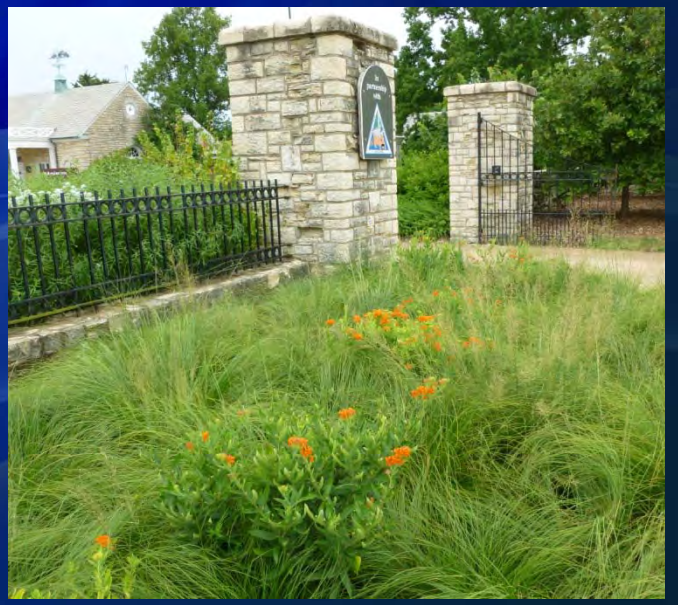
## Lawn Reduction to Capture Run-off

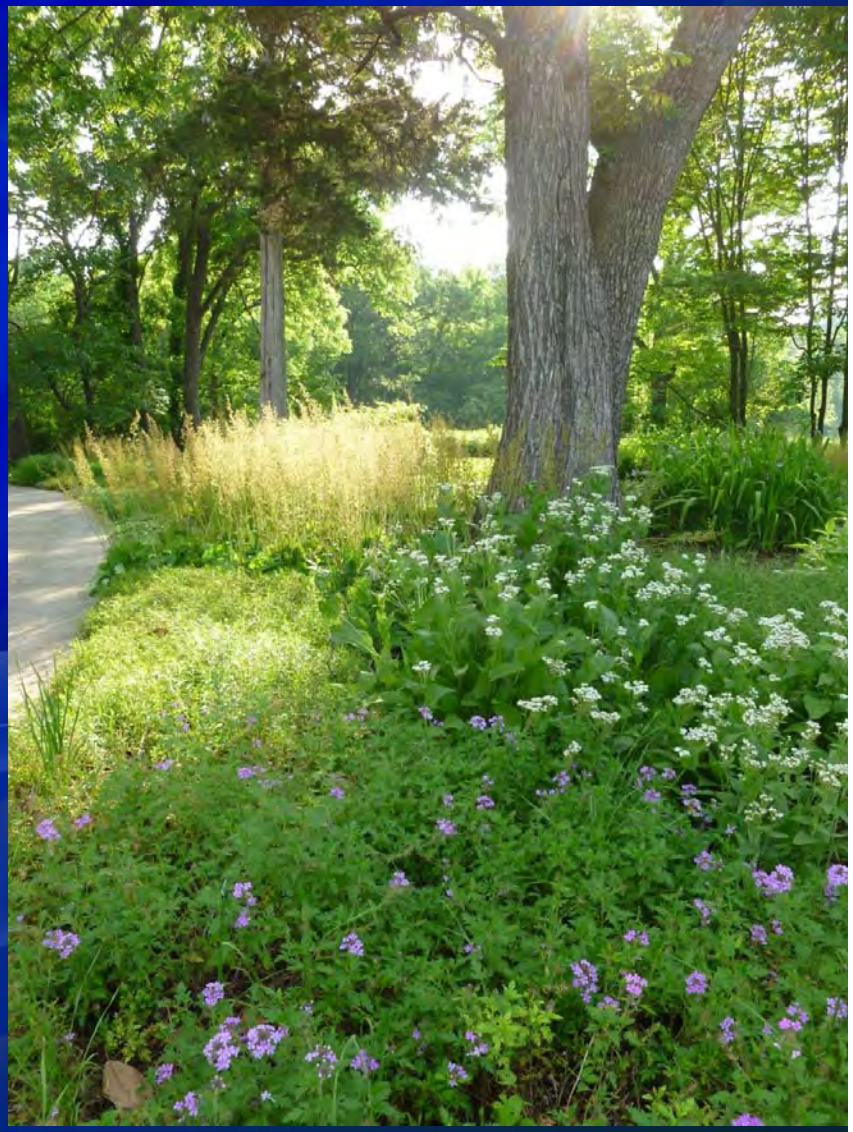
Turf, both above and below the soil surface, has very little biomass in comparison to larger perennials, shrubs and trees. The shallow root system of turf prevents the soil from maintaining its permeability (ability to soak up water), and in some cases may result in the formation of an impermeable clay shelf below the grass. Large expanses of irrigated and mowed lawn contribute to significant amounts of runoff that can contain pesticides and fertilizers.

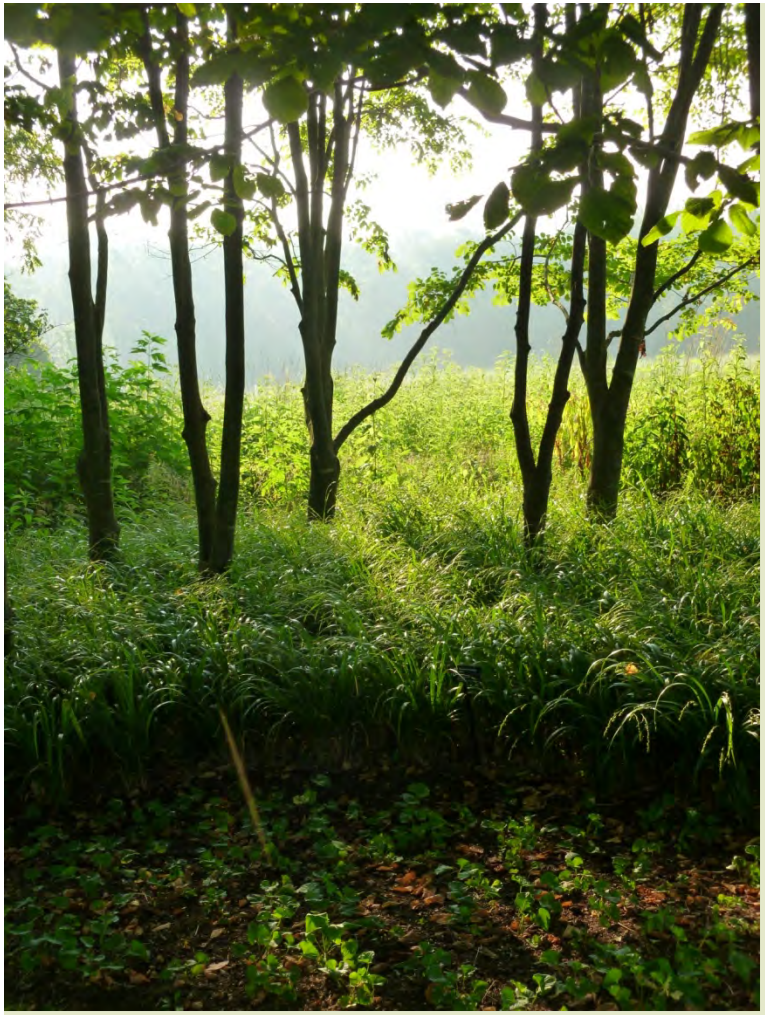
Replace turf with trees, shrubs, perennials and/or prairie gardens along with optional soil amendments and mulching to more effectively manage rainwater in your yard.

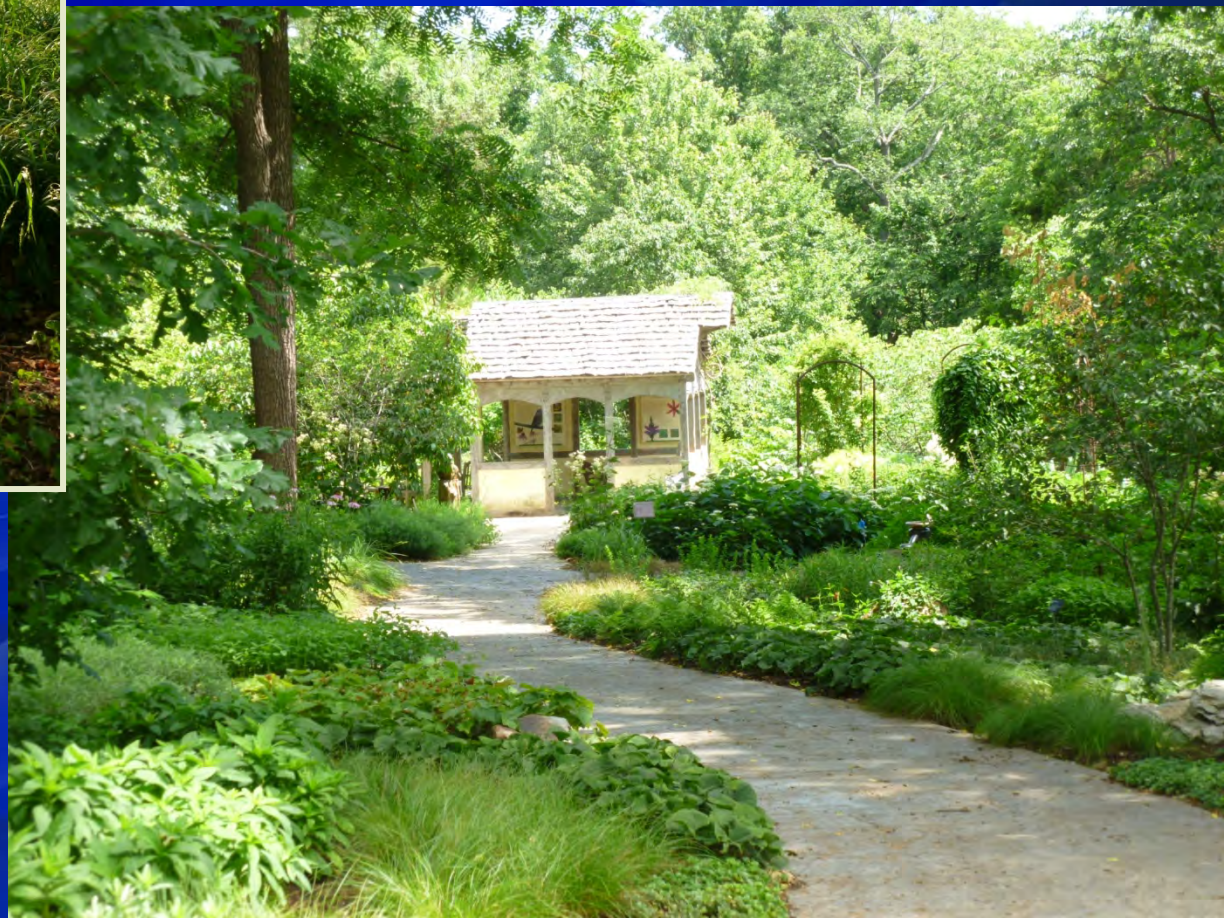
For more detailed lawn reduction recommendations see Transform Turf.

# Lawn Alternatives





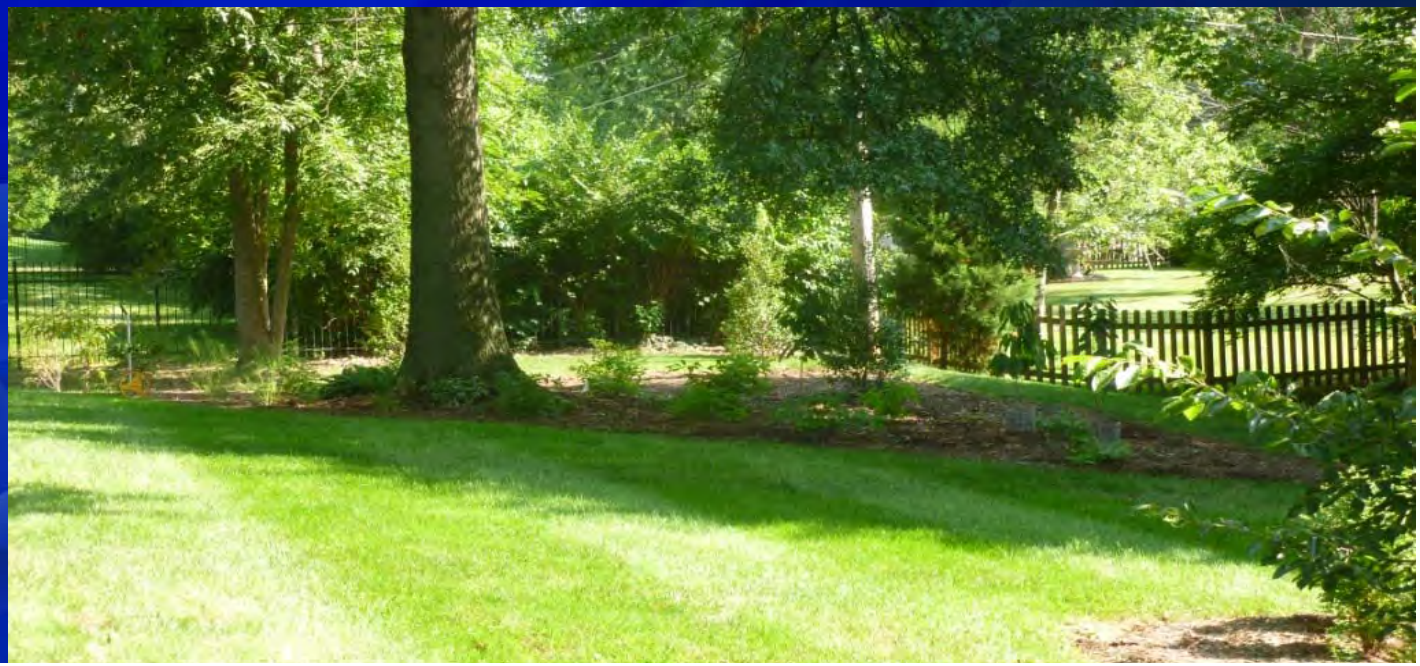




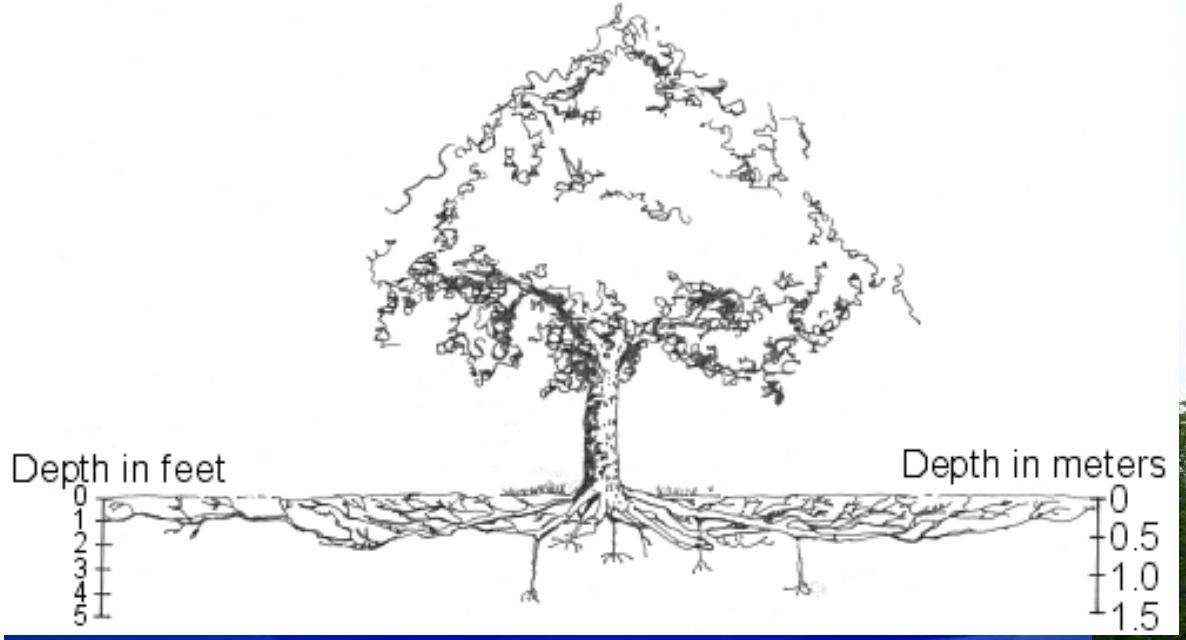
Listed as lawn alternative, woodland restoration and creek corridor vegetative buffer

- Pick one!!!
- ?Where is the woodland?
- Mowed turf to creek bank is not a buffer
- Lawn alternative = no mowed lawn

# Good examples of lawn alternatives…



# Trees and RainScaping



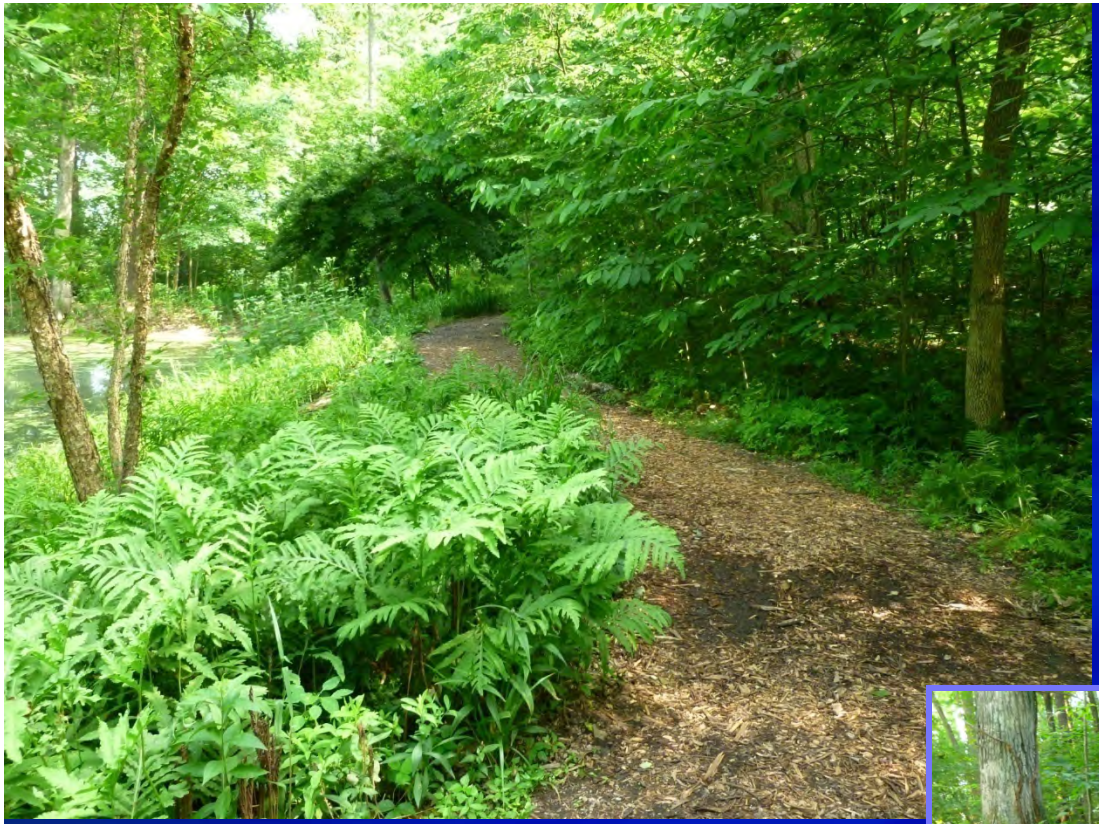

Protect your trees and add native species whenever possible

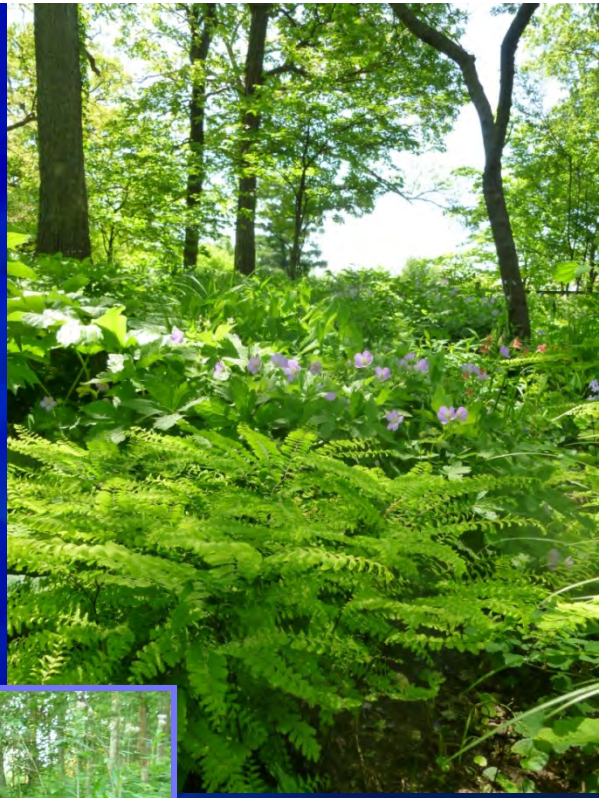
# RainScaping Guide: Woodland Restoration

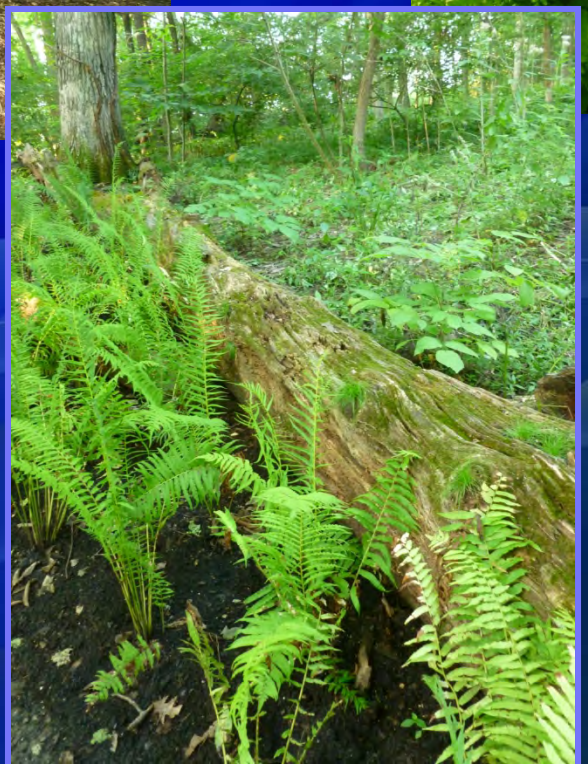
If your site is currently wooded, restoring a mix of healthy woodland vegetation is an effective rainwater management strategy.

Removal of invasive plant species (for example, bush honeysuckle) and long term control of all invasive species is essential in the successful restoration of woodland. Invasive species destroy the native ecosystem and out-compete native plants for nutrients, light and moisture. If these species are not controlled, they will continue to spread rapidly and diminish biodiversity as they overtake the woodland.

Following removal of invasive species, replant with mix of native plant species that is appropriate for your particular woodland (dry,







# Woodland Restoration

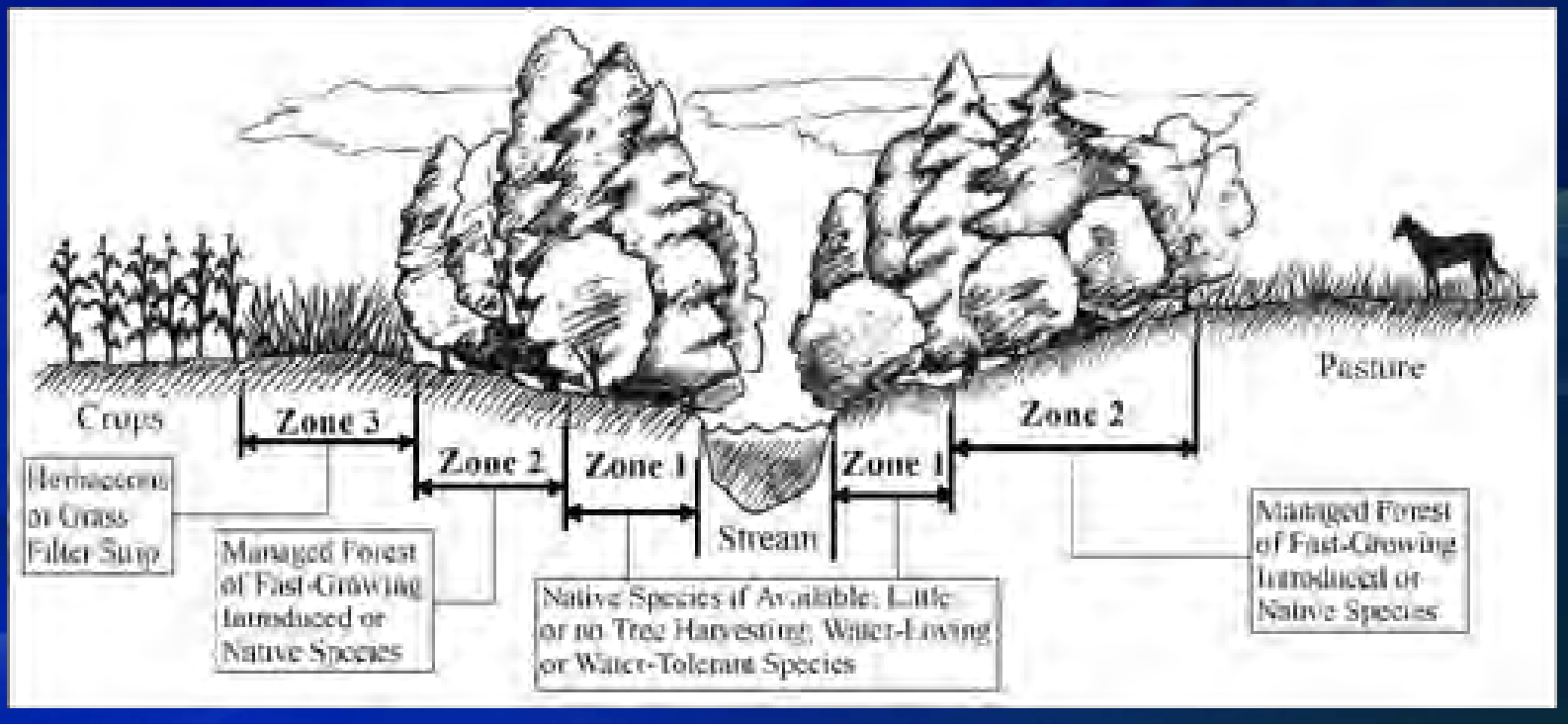
# Woodland Restoration

- bush honeysuckle was removed, new trees and shrubs were planted with some ground floor perennials added in

This was listed as woodland restoration…
So where is the woodland???

# RainScaping Guide: Creek Corridor Vegetative Buffers

A creek corridor is the transitional zone where land and stream come together. The land and riparian vegetation or plants that live along a waterway form the creek corridor and create a vegetative buffer strip along the stream. This buffer strip is essential to the health of the stream as it absorbs runoff, reduces erosion, filters out pollutants, shades the stream and provides food and habitat for a number of terrestrial and aquatic species.



Bad creek corridor vegetated buffer clean-up and planting

Good creek corridor vegetated buffer clean-up and planting

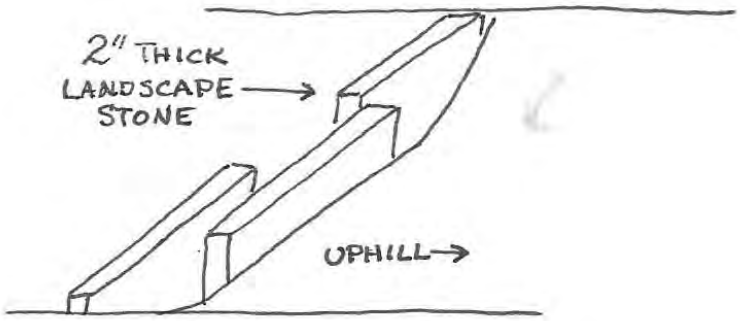
# RainScaping Guide: Rock Weirs & Sock Dams

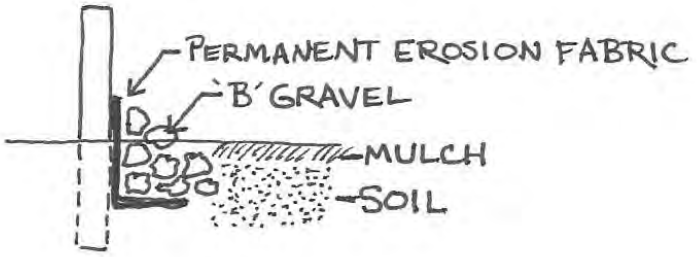
Compost sock check dams or rock weirs (a pile of stones lined up to slow down the flow of water on a hill) are used in place of traditional sediment and erosion control such as silt fences and straw bales. They:

- are used to control and keep sediment from soil erosion from flowing downhill, as is the case in newly constructed rain gardens or bioswales where soil has been exposed.
- slow the velocity of the flow of water, either at the inlet to the rain garden, the overflow of a rain garden or on a slope, thus reducing the potential for erosion.
- when placed at intervals along a bioswale, they slow down the velocity of water flowing through a bioswale.
- when used on hard surfaces, they prevent sediment from flowing into other areas.
- aid infiltration of water into the soil by slowing water flow.

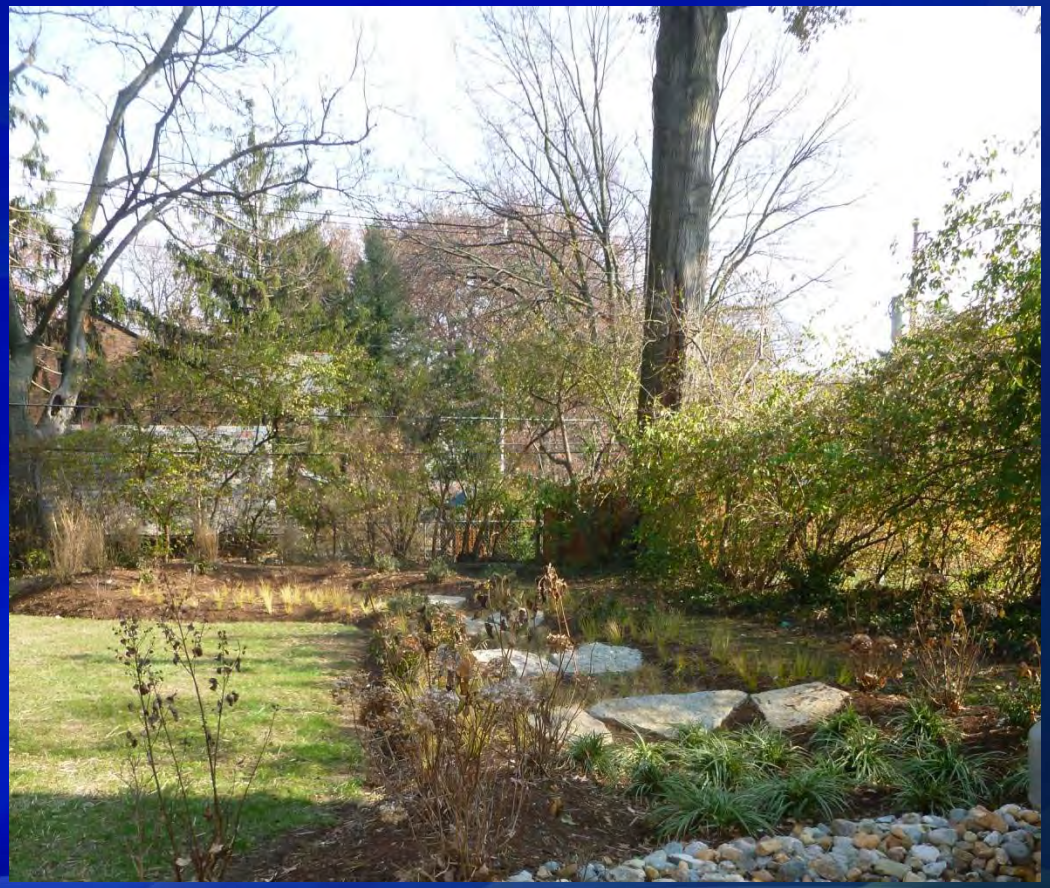
For more details on how and when to use check dams and weirs, see Stabilize Steep Slopes.

# Rock Weirs


2" THICK
LANDSCAPE
STONE
UPHILL→


PERMANENT EROSION FABRIC
'B' GRAVEL
MULCH
SOIL


6"
18"
8"



# RainScaping Guide: Green Roofs

Green roofs, also known as living or vegetated roofs, consist of plants and specialized soil over a protective, waterproof membrane that is laid on top of an existing roof structure. The plant palette is comprised of species that are able to tolerate high heat and dry conditions, such as native glade species and non-native plants such as *Sedum* or creeping thyme.

A green roof captures, slows down and reduces the quantity of rainfall before it enters the gutter. Green roofs also add energy savings by insulating the roof thus reducing heating and cooling costs. The existing roof must be reinforced to carry the additional weight load, anywhere from 15–30 lbs./sq. ft. or more depending on the depth of the soil. While installation of a green roof is initially more expensive than a conventional roof, a green roof has a much longer life span than a conventional roof. Approximate costs may range from $15/sq. ft. to $25/sq. ft. or more depending on the depth of the green roof soil and the specific plants used in the planting. When considering installing a green roof, it is recommended that you consult with an engineer/architect and a reputable roofing company well-versed in installing green roofs.

See our Green Roof Resources section for more information.

- **Work with an engineer to reinforce the roof**
- **Work with a knowledgeable roofing company**
- **Use plants adapted to the harsh, hot and dry environment**

# RainScaping Guide: Rainwater Harvesting

## Rain Barrels

Rain barrels are a small version of an above-ground cistern. They can range in size from 50 to 200 gallons, in contrast to cisterns that range in size from 100 to 1500 gallons or more. Rain barrels decrease rainwater runoff by collecting and storing rainwater from the roof. In addition, rain barrels provide, at no additional cost, chlorine-free water for use in watering plants and other water needs in the landscape.

A rain barrel is a barrel fitted with an upper (overflow) spigot and a lower spigot (for use in watering vegetation, etc.). The top is fitted with a screen or filter to keep debris and insects out of the barrel. It is a simple design that is inexpensive to construct. Rain barrels should be placed under a gutter downspout, with the downspout directed into the top of the rain barrel. It is helpful to elevate the rain barrel off the ground since the output for watering is gravity flow. The overflow spigot at the top of the rain barrel should have a hose connected that is directed into a rain garden or other landscape planting. More than one rain barrel can be used at each gutter downspout by connecting them together with the overflow spigot, or consider a larger above- or below-ground cistern for harvesting a higher volume of rainfall.

There are many models to choose from, or you can build your own. To build your own rain barrel download the River des Peres Watershed Coalition's Rain Barrel Building Instructions and Installation Guide or purchase an already-constructed rain barrel by downloading an order form.

## Cisterns

A cistern is a water storage tank installed either underground or above ground (size varies from 100 gallons to 1500 gallons or more). Water is captured and stored from gutter downspouts diverted into the cisterns, making it available for later use. The most common use is for watering the surrounding landscape. A household shallow well pump can be installed to pump and distribute this stored water from the tank to a hose bib for watering, or may be connected directly to drip irrigation equipment, etc. This cost-free source of water contains less minerals and chemicals and aids in healthier plant growth.

# Rain Barrels and Cisterns

# RainScaping Guide: Vegetated Bioswales

A bioswale is a linear, shallow, planted depression that guides water away from its entry point on the property (gutter downspouts, uphill properties, etc.) and towards a rain garden. Bioswales are also useful for directing water from a rain garden (in the event the rain garden overflows) and towards its exit point on the property or simply to guide water as it moves through the property. These swales are planted or seeded with moisture-loving plant species that are also tolerant of seasonal fluctuations in moisture levels. The plants' structure aids in reducing the flow rate of rainwater runoff and enhances the soil's absorption of water even before it enters the rain garden retention area or exit point.

Bioswales can be constructed independent of a rain garden if circumstances don't allow for the installation of a rain garden (such as limited space or steep, narrow sites). In this case, they guide water to existing storm-water systems such as storm drains in roadways, etc.

Where volume and velocity of water is high, a constructed dry creek bed made of gravel may substitute for a vegetated bioswale. Vegetated swales are preferred, however, as Meramec River gravel is typically the source of gravel in the Greater St. Louis Region, and gravel mining is known to be a major contributor to water quality degradation in the Meramec River watershed.

# Bioswale

A french drain is not a bioswale – where are the plants???

# Bioswale ending in a rain garden

# RainScaping Guide: Rain Gardens

A rain garden slows the flow of rainwater runoff by using elements similar to those that occur in nature: plants, stone, shallow swales and depressions that catch and hold rainwater rather than let it run off unhindered. Plants that offer a diversity of both deep and fibrous root systems help make the soil more permeable, sponge-like and able to absorb a large amount of rainfall. Native plants are typically preferred due to their hardy nature. Water gathers temporarily in shallow depressions and is absorbed by the soil and plants as well as being filtered as it percolates through the soil horizon.

There are two major categories of rain garden design:

1. **Native Soil Rain Garden**
   A homeowner who plans to install a rain garden where no development or redevelopment is taking place may prefer this low cost option. Soil pore space is gradually improved over time through the combined interactions of added well-aged compost, mulch, microbes, and deep rooted plants. Plants that are able to tolerate primarily moist (and sometimes dry) soils thrive best in these environments. A rain garden is not necessarily the right solution for your site. For detailed guidance on where and how to install a native soil rain garden, as well as recommended alternatives to rain gardens under certain conditions, see How to RainScape. For a comprehensive overview of rain garden design using an intuitive visual interface, check out this interactive graphic from the University of Nebraska–Extension.

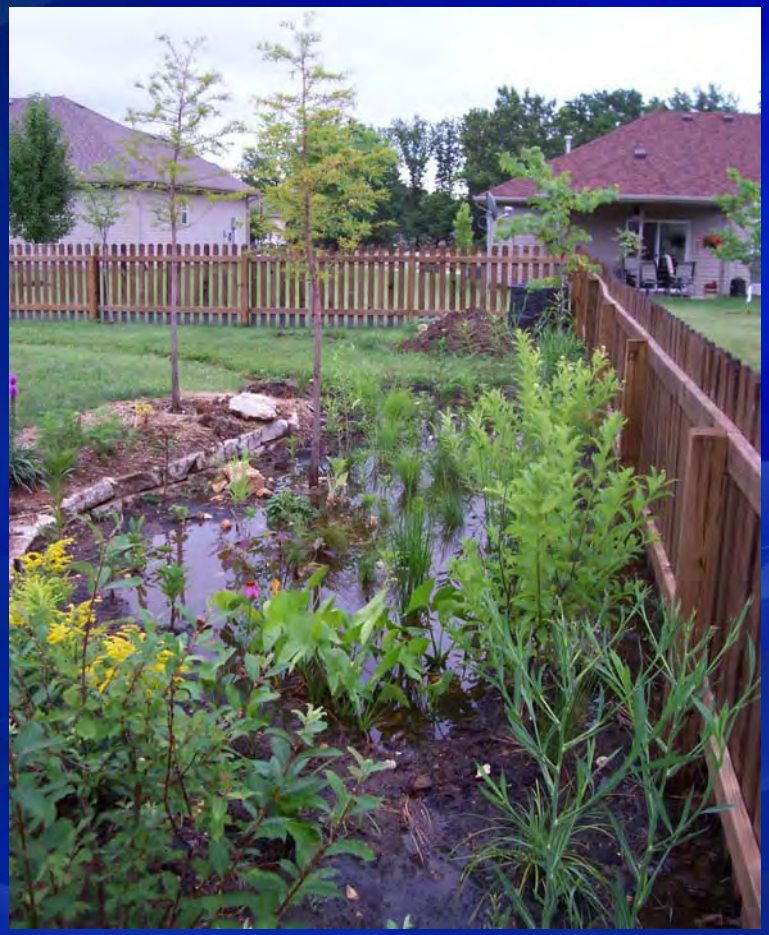
2. **Engineered Bioretention System**
   Where development or redevelopment is occurring engineered bioretention may be specified. The commercially designed rain garden requires the removal of existing soil and replacement with a 60–80 percent sandy soil mix, typically along with a piped underdrain. Plants that are able to tolerate primarily dry (and sometimes wet) soils thrive best in these environments. For more information on how to design an engineered bioretention system download the MSD Landscape Guide for Stormwater Best Management Practices [pdf].

## RainScaping Quick Links




*The Missouri Botanical Garden RainScaping Guide is partially funded by the Mabel Dorn Reeder Foundation and US EPA Region 7 through the Department of Natural Resources (subgrant number G11-NPS-15), under Section 319 of the Clean Water Act.*

# Native Soil Rain Garden



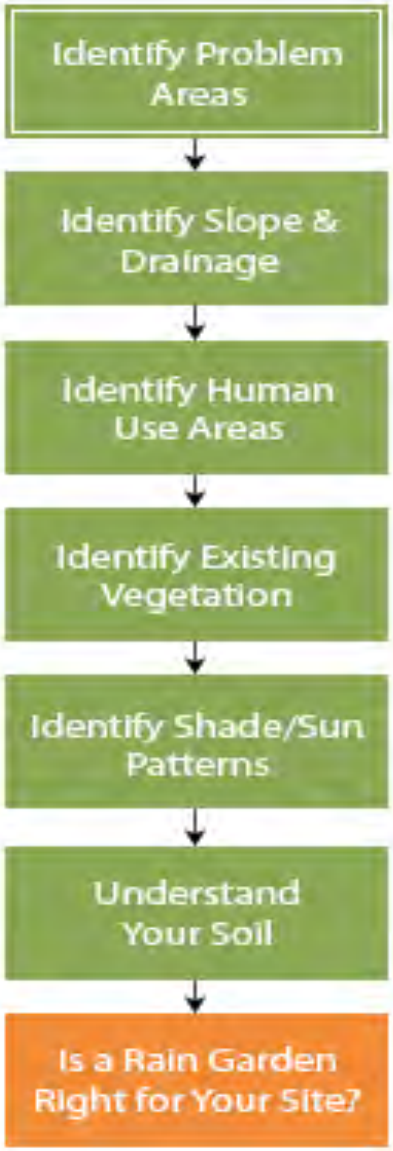
# Bioretention System

# How To RainScape

## How to RainScape

For guidance on which RainScaping features will work best in your yard and how to install them, follow our **RainScaping Flowchart** below. Click on a step to go to that section:

# What do you know about your site?




## Identify Problem Areas

Identifying problem areas on your property helps determine your goals and indicates choices for specific landscape options to solve problems.

### Topography and Flow

Observe the topography of your property and note how water flows during periods of heavy rainfall, as well as where offsite water enters the property. Other potential problem areas to record on your map include steep slopes, ponding in low wet areas, areas of recent construction and utility lines.

### Utilities

Be sure to include overhead utilities on your map. In addition, call 1 (800) DIG-RITE to have all underground utilities identified and add them to your map as well.

▸ *Continue on to Identify Slope & Drainage*

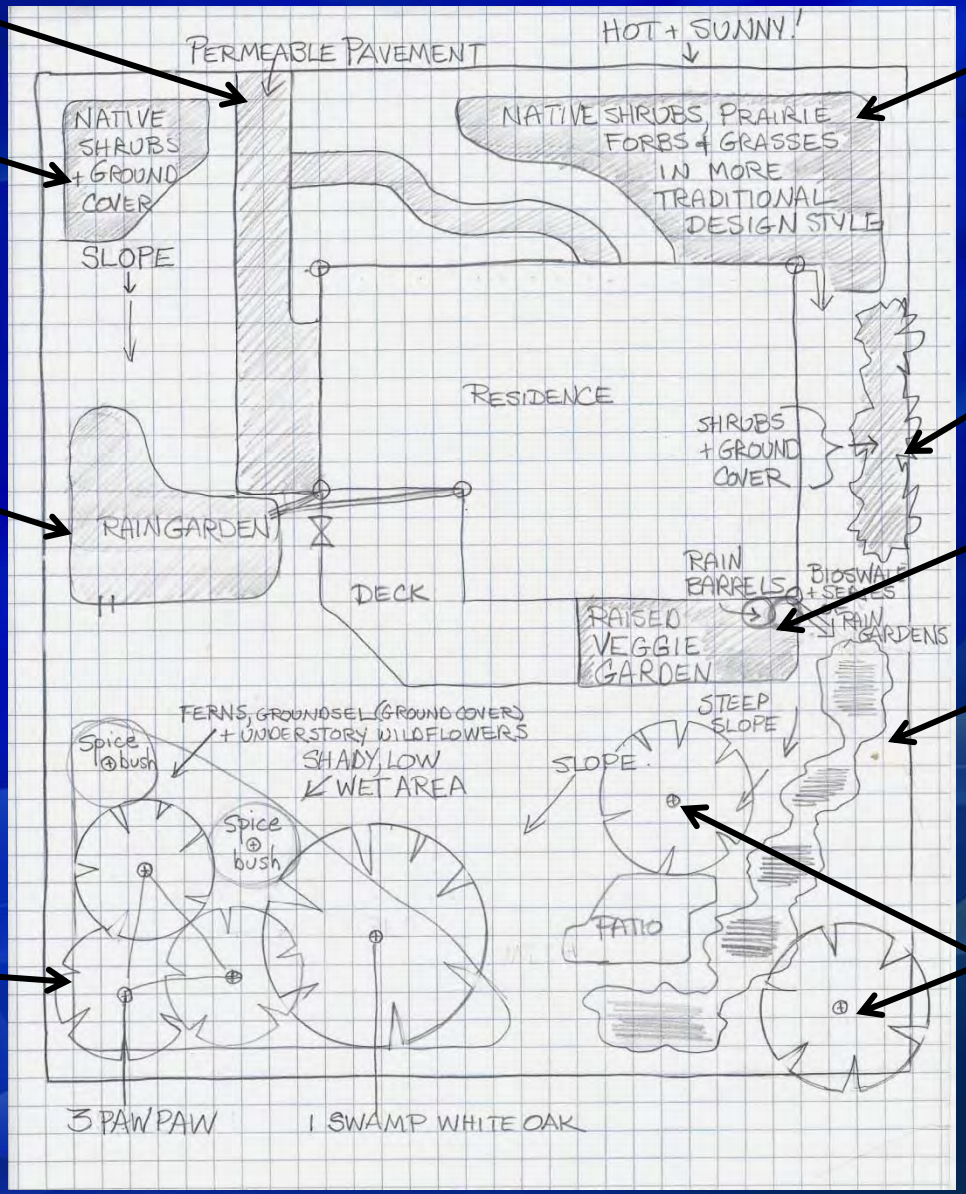
# Overview of Landscape Elements for Rainscaping

Permeable paving

Perennial/shrub planting beds

Rain garden

Perennials, shrubs and trees planted in low, wet area of yard




Perennial/shrub planting bed

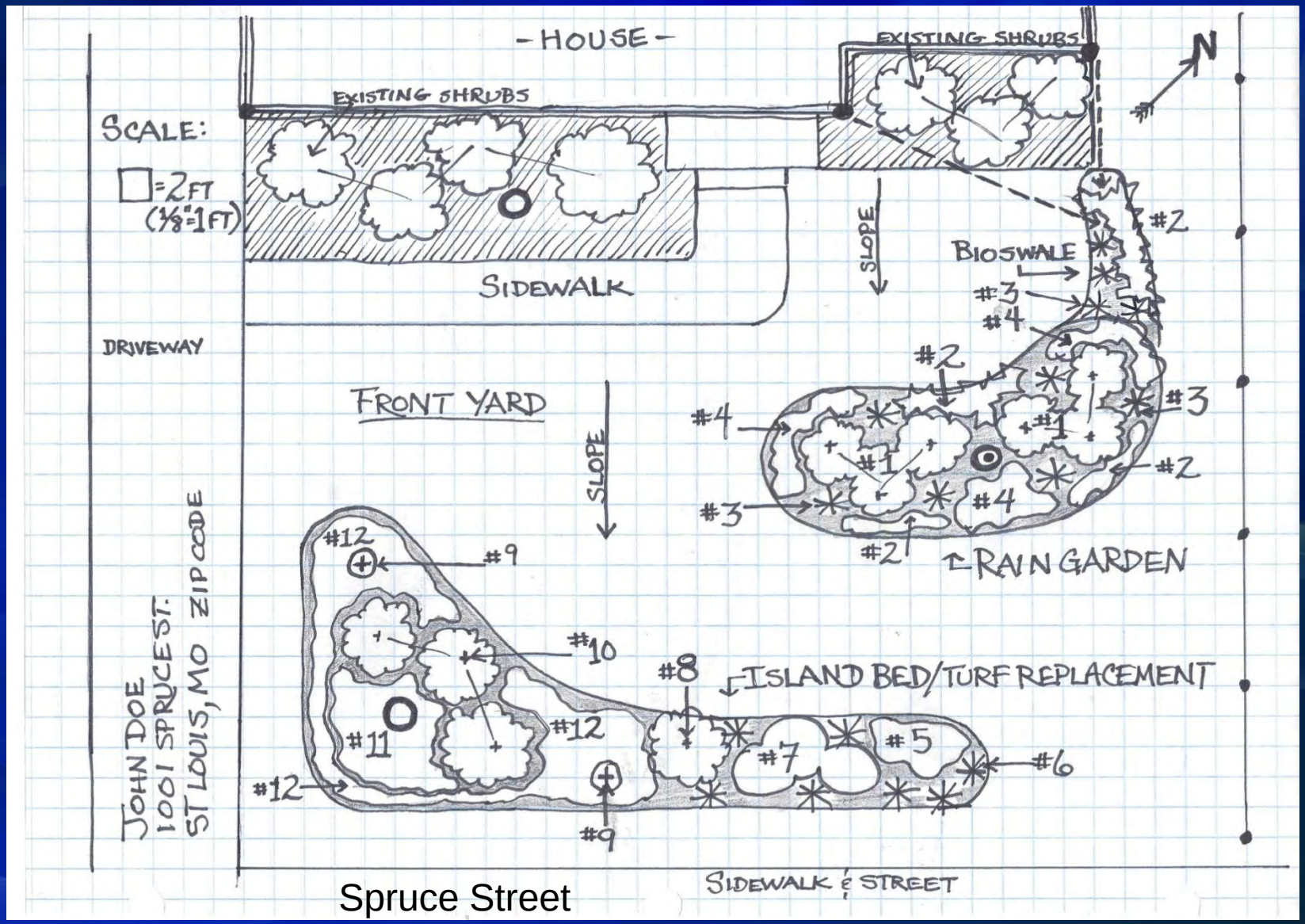
Perennial/shrub planting bed

Rain barrels

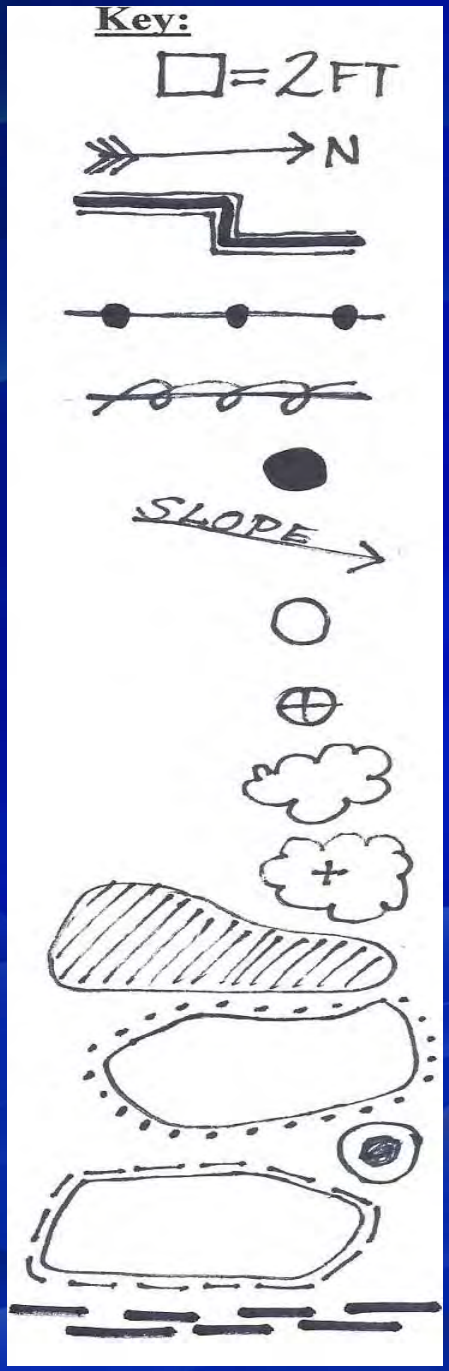
Planted bioswale connecting small rain gardens

Trees

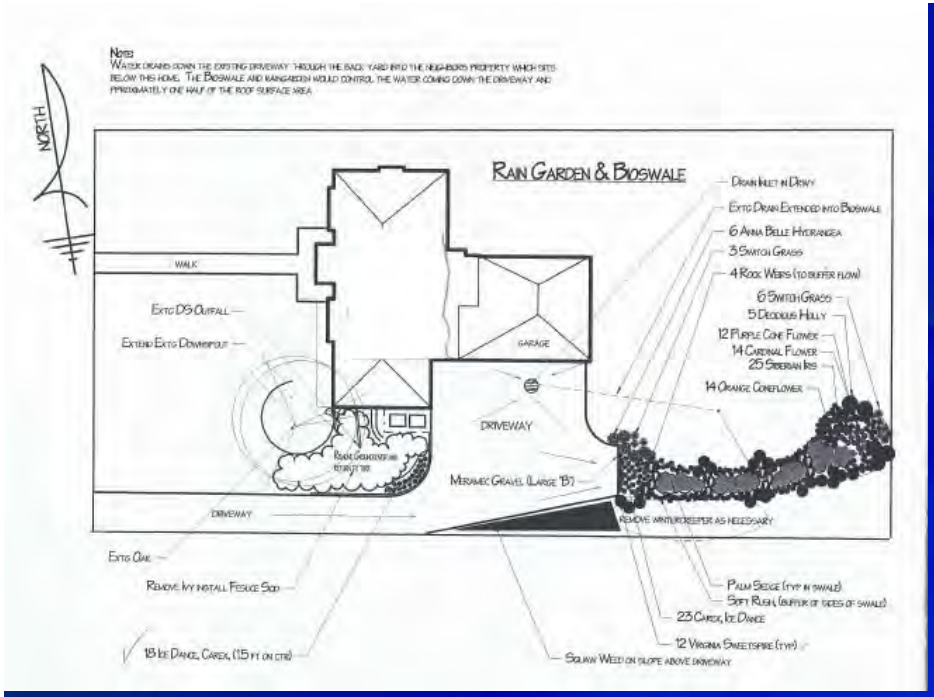
# Sample Homeowner Plan

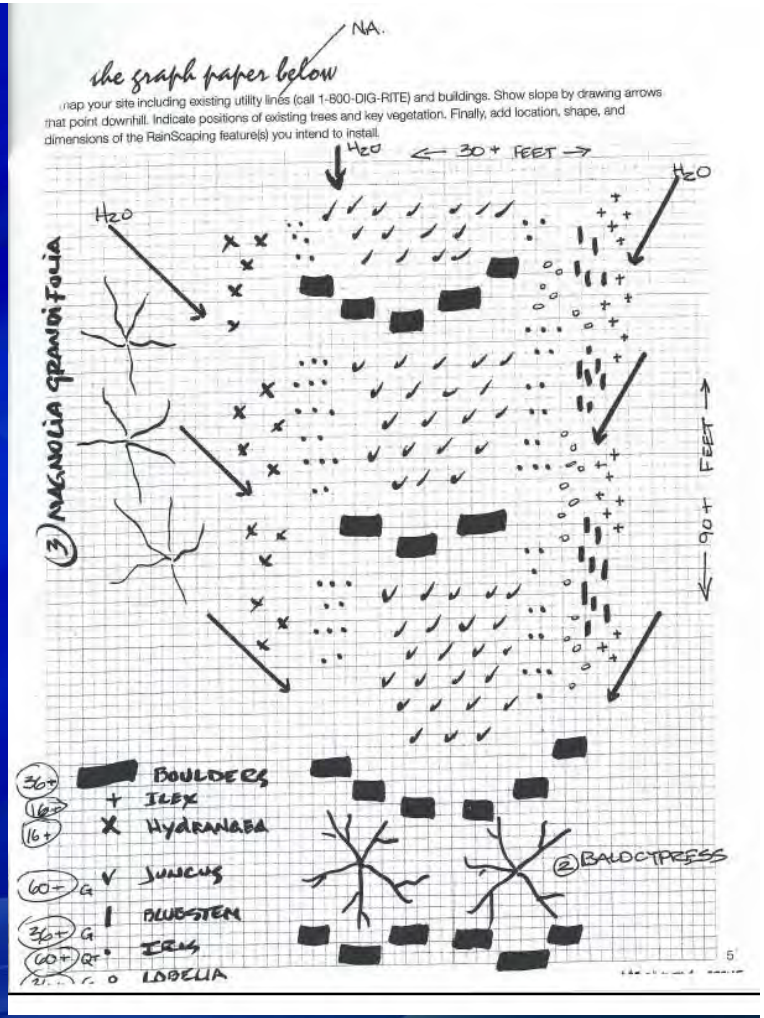


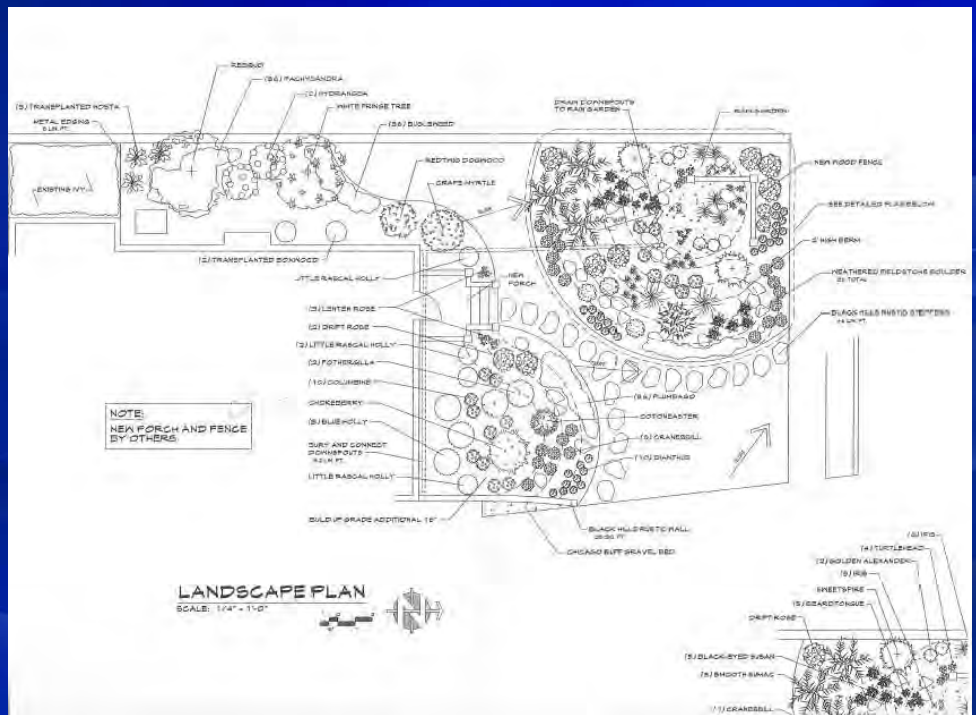

Spruce Street




- Scale for drawing
- Orientation of property to North
- House and other buildings
- Above ground utility lines
- Below ground utilities
- Downspout on house
- Direction of slope
- Existing tree
- Proposed tree
- Existing shrub
- Proposed shrub
- Existing herbaceous planting
- Proposed herbaceous planting
- Percolation test location
- Rain garden outline
- Underground pipe

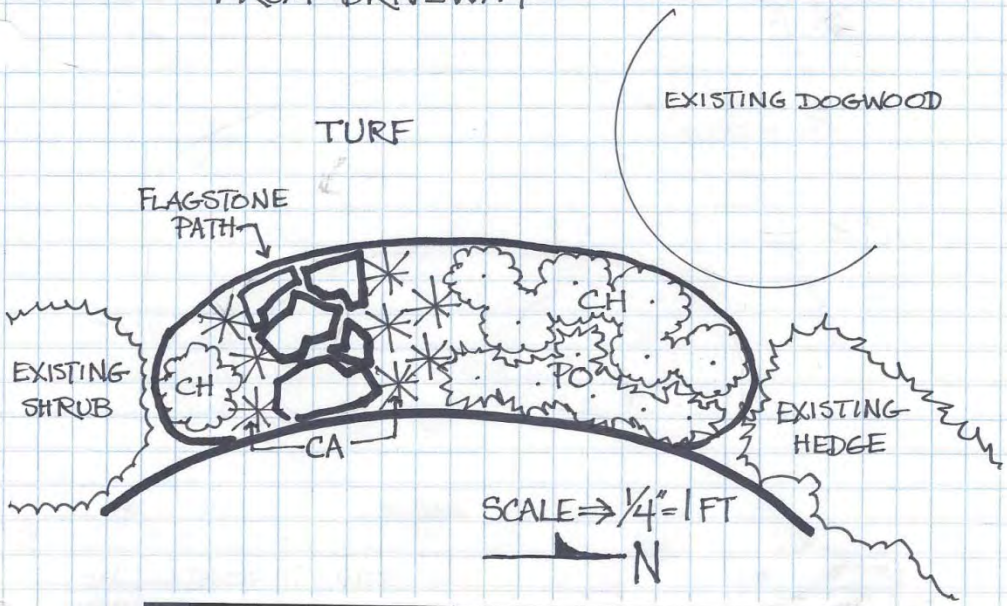



Good overview and actual plans

## #2 LAWN ALTERNATIVE TO CATCH RUNOFF FROM DRIVEWAY



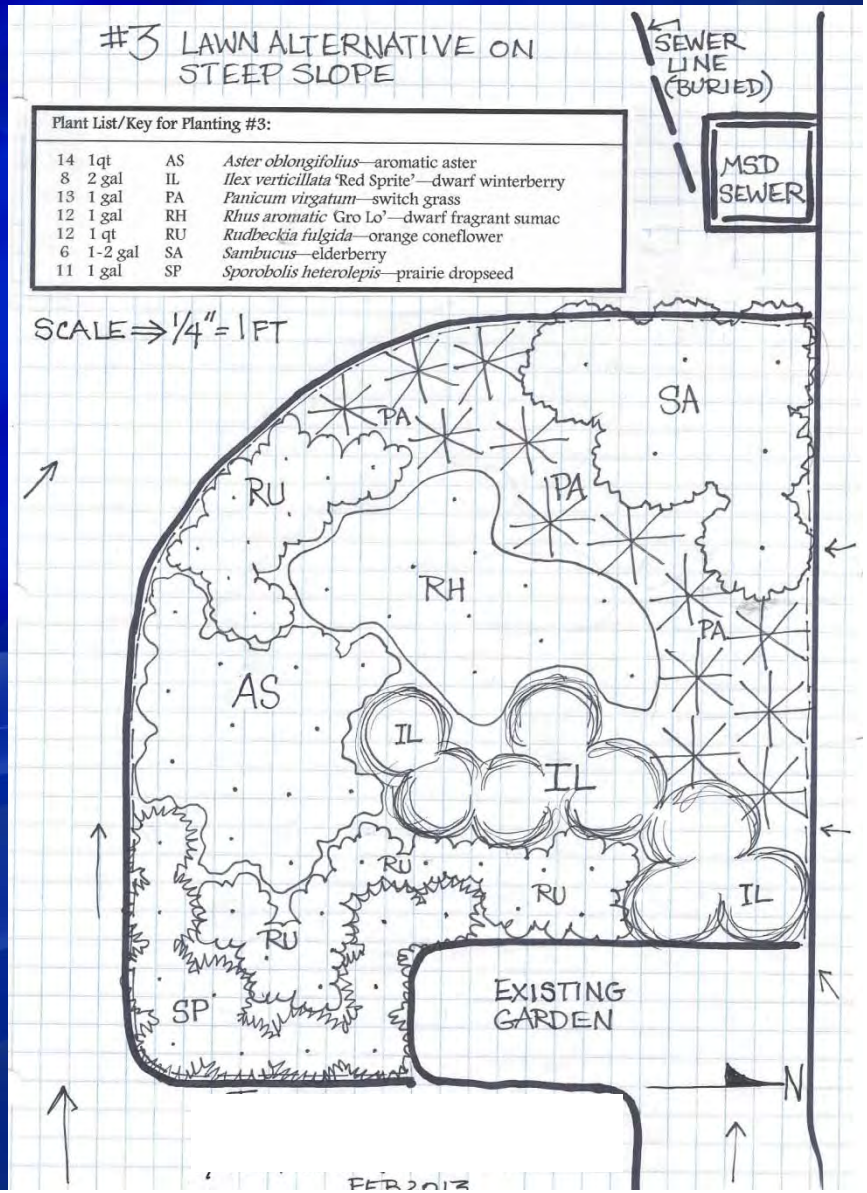

**Plant List/Key for Planting #2:**

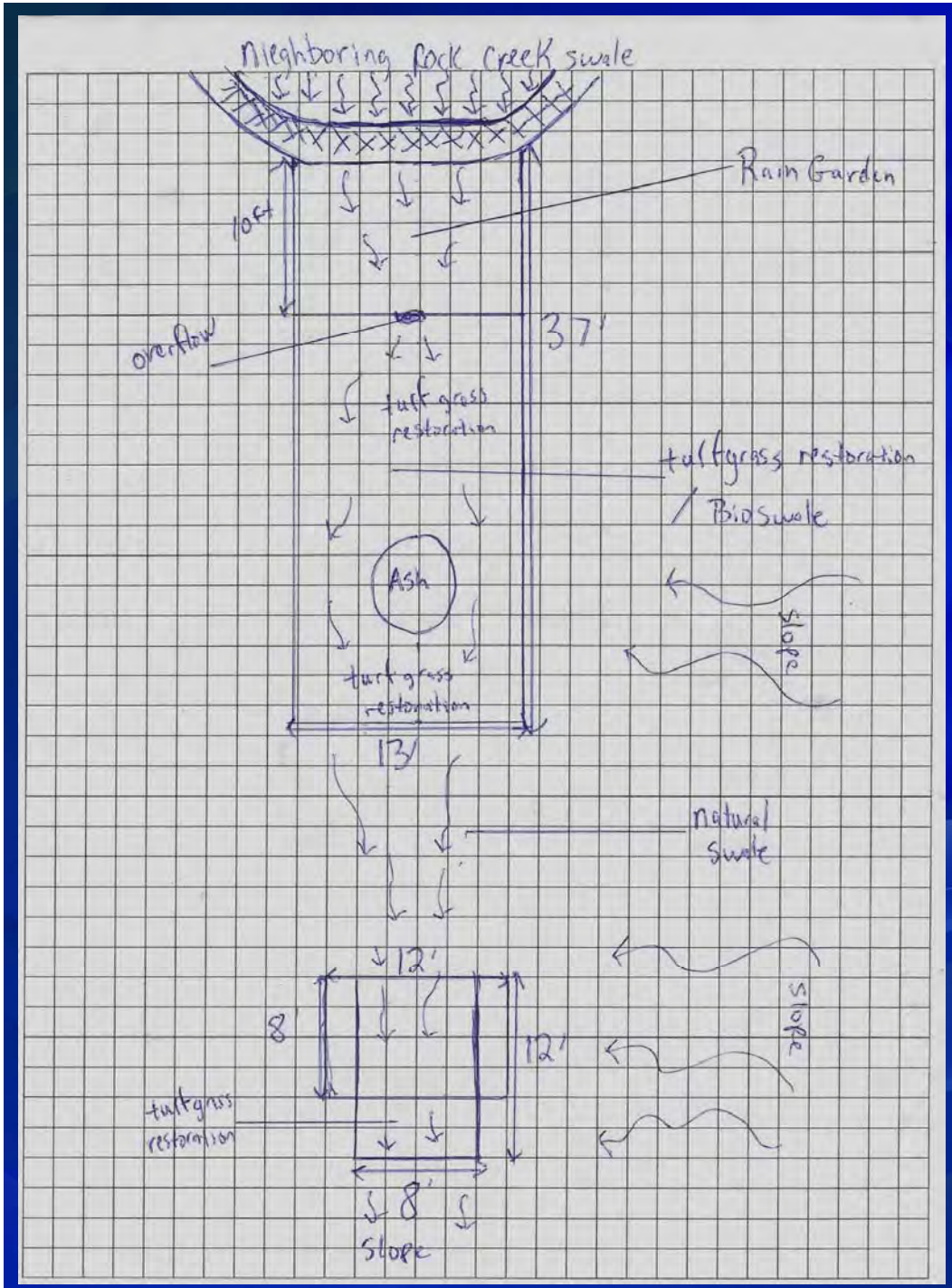
| | | | |
|---|---|---|---|
| 8 | 1qt | CA | *Carex albicans*—oak sedge |
| 7 | 1 gal | CH | *Chelone obliqua*—turtlehead |
| 6 | 1 qt | PO | *Polemonium reptans*—Jacob's ladder |

## #3 LAWN ALTERNATIVE ON STEEP SLOPE

**Plant List/Key for Planting #3:**

| | | | |
|---|---|---|---|
| 14 | 1qt | AS | *Aster oblongifolius*—aromatic aster |
| 8 | 2 gal | IL | *Ilex verticillata* 'Red Sprite'—dwarf winterberry |
| 13 | 1 gal | PA | *Panicum virgatum*—switch grass |
| 12 | 1 gal | RH | *Rhus aromatic* 'Gro Lo'—dwarf fragrant sumac |
| 12 | 1 qt | RU | *Rudbeckia fulgida*—orange coneflower |
| 6 | 1-2 gal | SA | *Sambucus*—elderberry |
| 11 | 1 gal | SP | *Sporobolis heterolepis*—prairie dropseed |






# NOT a good overview example

- Scale not indicated, but some measurements are included
- Individual plant placement and numbers not indicated
- Location of percolation test not indicated
- North orientation not indicated
- Is it a bioswale or a lawn alternative? Says both for one feature?
- There was not an overview of the property showing the future location of the rainscaping features.

Good plant list with all required aspects

| Plant genus & species | How many | Spacing | Container size | Native? | Price each |
|---|---|---|---|---|---|
| Black chokeberry ( Aronia melanocarpa) | 1 | 4' | Quart (4.5in x 5) | yes | 4.75 |
| Cardinal flower ( Lobelia cardinalis) | 8 | 18" | 2 3/8in x 5 | yes | 2.25 |
| Celandine poppy (stylophorum diphyllum) | 10 | 18" | 2 3/8in x 5 | yes | 2.25 |
| Christmas fern (polystichum acrostichoides) | 4 | 18" | Quart (4.5in x 5) | yes | 4.50 |
| Cinnamon fern (Osmunda cinnamomea) | 3 | 18" | Quart (4.5in x 5) | yes | 4.50 |
| Columbine (Aquilegia canadensis) | 5 | 18" | 2 3/8in x 5 | yes | 2.25 |
| Copper iris (Iris fulva) | 4 | 18" | Quart (4.5in x 5) | yes | 4.50 |
| Crested Iris (iris cristata) | 4 | 18" | Quart (4.5in x 5) | yes | 4.50 |
| Downy skullcap (Scutellaria incana) | 4 | 18" | Quart (4.5in x 5) | yes | 4.50 |
| Globe sedge (carex grayii) | 5 | 18" | 2 3/8in x 5 | yes | 2.25 |
| Great blue lobelia ( Lobelia siphilitica) | 3 | 18" | 2 3/8in x 5 | yes | 2.25 |
| Indian pink (spigelia marilandica) | 4 | 18" | 2 3/8in x 5 | yes | 2.25 |
| Lady fern (felix femina) | 3 | 18" | Quart (4.5in x 5) | yes | 4.50 |
| Oak sedge (carex albicans) | 10 | 12" | 2 3/8in x 5 | yes | 2.25 |
| Spider lily ( Hymenocallis occidentalis) | 3 | 18" | 2 3/8in x 5 | yes | 2.25 |
| Virginia sweetspire (Itea virginica) | 1 | 4' | Quart (4.5in x 5) | yes | 4.75 |
| Wild ageratum ( eupatorium coelestinum) | 3 | 18" | 2 3/8in x 5 | yes | 2.25 |
| Wild ginger ( Asarum canadense) | 12 | 12" | Quart (4.5in x 5) | yes | 4.50 |
| Woodland Phlox ( phlox divaricata) | 6 | 18" | 2 3/8in x 5 | yes | 2.25 |
| Woodland spiderwort ( tradescantia ernestiana) | 5 | 18" | Quart (4.5in x 5) | yes | 4.50 |
| Zigzag goldenrod (Solidago flexicaulis) | 6 | 18" | Quart (4.5in x 5) | yes | 4.50 |

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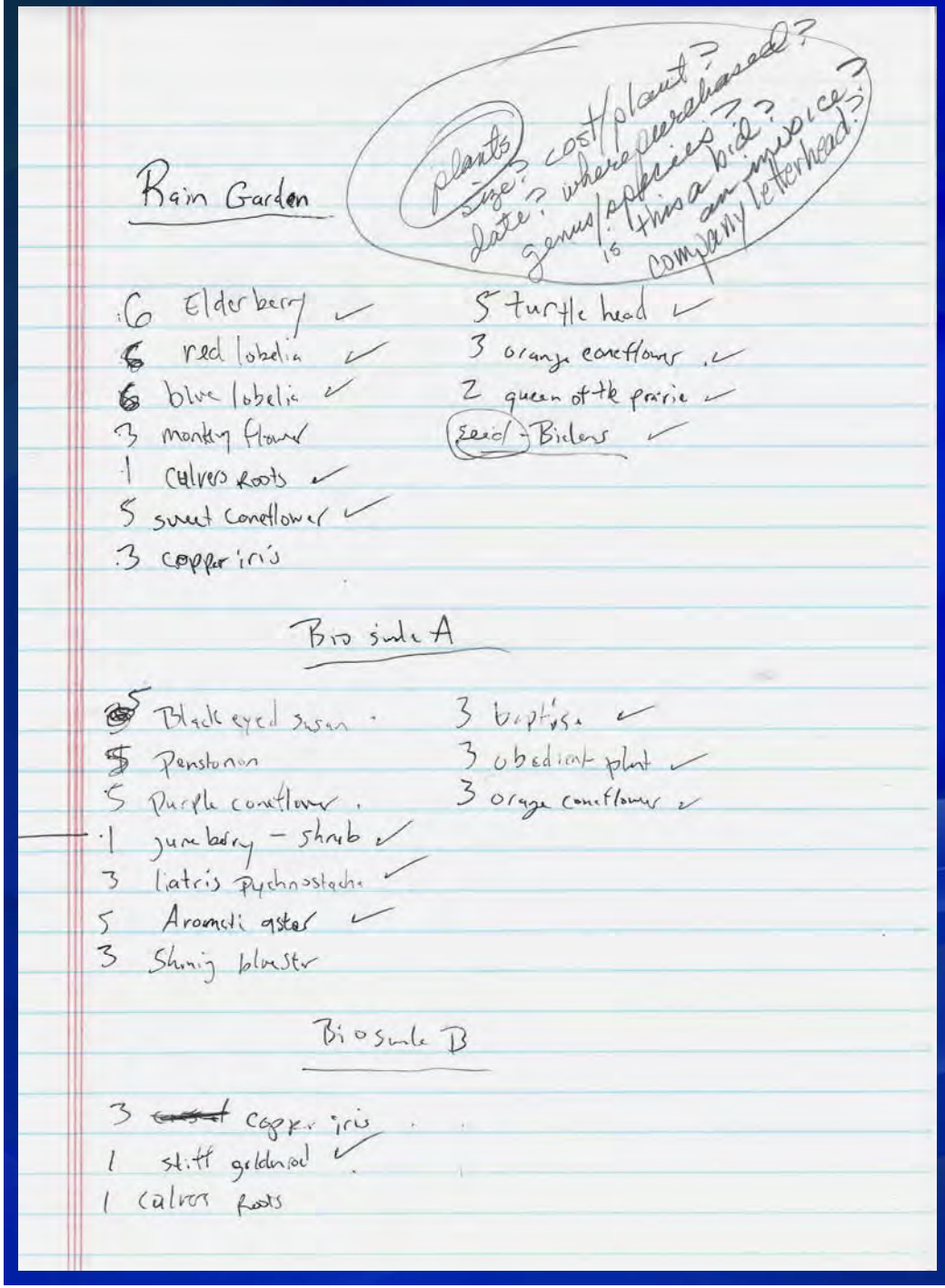
Bad plant list - original plant list is not on same page/incomplete and final doesn't match very well

Plants and Material List cont.

| | | | | | |
|---|---|---|---|---|---|
| #7 | Amsonia tabernaemontana | 5 | 1gal | 1gal | Native |
| 8 | Chasmanthium latifolium | 10 | " | " | " |
| 9 | Eupatorium purpureum | 5 | " | " | " |
| 10 | Asclepias incarnata | 4 | " | " | " |
| 11 | Carex ice dance | 10 | " | " | |
| 12 | Liriope cultivars | 15 | " | " | |
| 13 | Panicum virgatum | 10 | " | " | Native |
| 14 | Carex stricta | 10 | " | " | " |
| 15 | Stylophorum diphyllum | 10 | " | " | " |
| | Mulch-double leaf compost | | | | |

| QTY | VARIETY | SIZE | UNIT | AMOUNT |
|---|---|---|---|---|
| | RAIN GARDEN PROJECT | | | |
| | PLANTS AND MATERIALS | | | |
| 4 | RIVER OATS PLANTS | | $15.00 | $60.00 |
| 4 | SWEET FLAG PLANTS | | $12.00 | $48.00 |
| 2 | NINEBARK PLANTS | | $44.00 | $88.00 |
| 1 | VIBURNUM PLANT | | | $38.00 |
| 4 | CLETHRA PLANTS | | $32.00 | $128.00 |
| 3 | HYDRANGIA PLANTS | | $40.00 | $120.00 |
| | COMPOST AND HARDWOOD MULCH | | | $185.00 |
| | | SUBTOTAL | | $667.00 |
| | | | TAX | $55.00 |
| | | | LABOR | $250.00 |



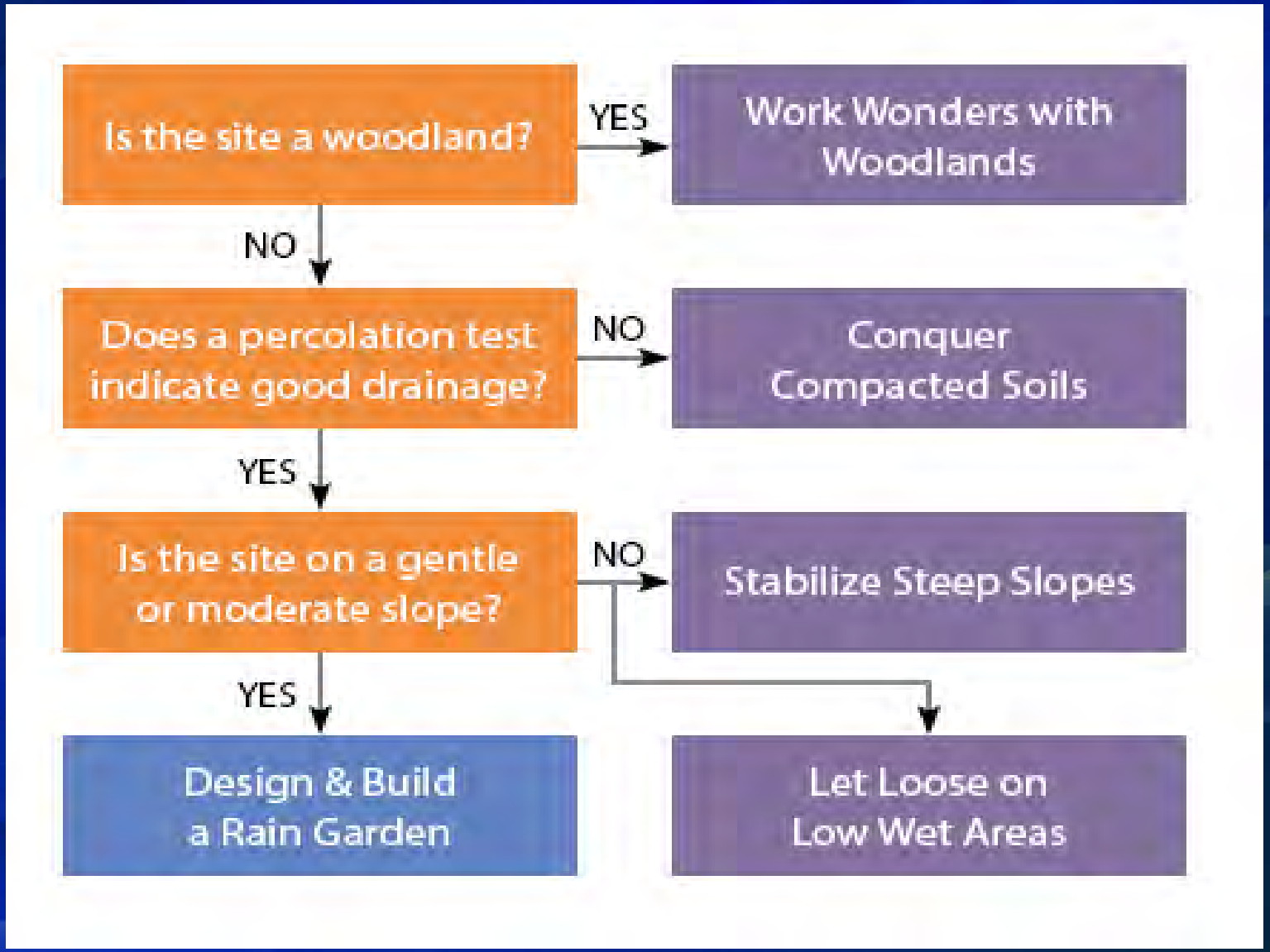

# NOT a good plant list

- Genus + species not listed w/common name
- Size of container and cost per plant not listed
- Spacing of plants not indicated
- Source/where purchasing the plants is not listed per plant
-

# IS a good plant list

| Qty | Plant | Scientific | | MO Native | Size | Cost | TOTAL | Source |
|---|---|---|---|---|---|---|---|---|
| AREA 1 - WOODLAND RESTORATION/CREEK CORRIDOR VEGETATIVE BARRIER | | | | | | | | |
| *1. Remove dead trees/vegetation overgrowth - bush honeysuckle; vinca; euonymous; poison ivy; grapevine* | | | | | | | | |
| *2. New Plants to be installed* | | | | | | | | |
| 3 | Eastern Redbud | cercis canadersis | Applachain Red | Yes | 1.5 - 1.75 | $ 62.00 | $ 186.00 | Glueck |
| 3 | Dogwood | cornus florida | Cher Princess | Yes | 4' - 5' | $ 33.70 | $ 101.10 | Glueck |
| 6 | Hydrangea Oakleaf | Quercifolia "Alice" | | | #3 | $ 16.50 | $ 99.00 | Glueck |
| 6 | Ostrich Ferns | matteuccia struthriopteris | | Yes | 3.5" pot | $ 6.98 | $ 41.88 | American Meadows |
| 6 | Variegated Sweet flag | acorus calamus "Variegatus | | | bare root | $ 5.07 | $ 30.42 | Vermont Wildflower Farm |
| 3 | Rhododendrum "Mary Fleming" | Rhododendrum "Mary Fleming" | Broadleaf Evergreen | | #6 | $ 31.60 | $ 94.80 | Glueck |
| 3 | Rhododendron "Stewartsonian" | Rhododendron "Stewartsonian" | Broadleaf Evergreen | | #6 | $ 31.00 | $ 93.00 | Glueck |
| 2 | Black Chokeberry | Aronia melancarpa 'Morton' | Iroquois Beauty | Yes | | $ 29.00 | $ 58.00 | Glueck |
| 1 | Dawn Redwood | mesasequoia glyptostroboides | | | 1 ¼ – 1 ½ | $ 41.50 | $ 41.50 | Glueck |
| 5 | Virginia Bluebells | mertensia virginica | | | bare root | $ 8.49 | $ 42.45 | American Meadows |
| 9 | Solomon's Seal | Polygonatum biflorum | | Yes | 4' Pot | $ 6.99 | $ 62.91 | Prairie Nursery |
| 15 | Eastern Star Sedge | carex radiata | | Yes | 4" pot | $ 4.99 | $ 74.85 | Prairie Nursery |
| | | | | | | | | |
| AREA 2: Woodland Restoration | | | | | | | | |
| *1. Remove dead trees/vegetation overgrowth - bush honeysuckle; vinca; euonymous; poison ivy; grapevine* | | | | | | | | |
| *2. New Plants to be installed* | | | | | | | | |
| Rain Garden: | | | | | | | | |
| 3 | Viburnum | burkwoodii "Mohawk" | Burkwood Viburnum | Yes | BB 30 -36" | $ 25.00 | $ 75.00 | Glueck |
| 9 | Brown eyed Susan | Rudbeckia triloba | | Yes | | $ 3.99 | $ 35.91 | Prairie Nursery |
| 9 | Great Blue Lobelai | lobelia siphilitica | | Yes | | $ 3.99 | $ 35.91 | Prairie Nursery |
| 3 | Coneflower | | Magnus Purple | Yes | #1 | $ 6.50 | $ 19.50 | Glueck |
| 8 | Coneflower | | Big Sky Sundown | | #1 | $ 10.50 | $ 84.00 | Glueck |
| 4 | Prarie Mallow | hibiscus lasiocarpus | | Yes | potted | $ 6.99 | $ 27.96 | Fields |
| 6 | Ligularia "The Rocket" | | | | Bare root | $ 4.96 | $ 29.76 | American Meadows |
| | | | | | | | | |

# Is a Rain Garden Right for your Site?



# Percolation Test
## to determine rate of water infiltration into the soil

- **Do I need to amend the soil to make it more permeable?**
- **Is the site suitable for a rain garden?**

***Percolation Test Steps:***

**1. Dig a hole 12” deep by 6” in diameter.**

**2. Fill hole with water and let stand until all the water has drained into the ground (this will give you saturated soil conditions).**

**3. Refill the empty hole with water again. Measure the depth of the water with a ruler.**

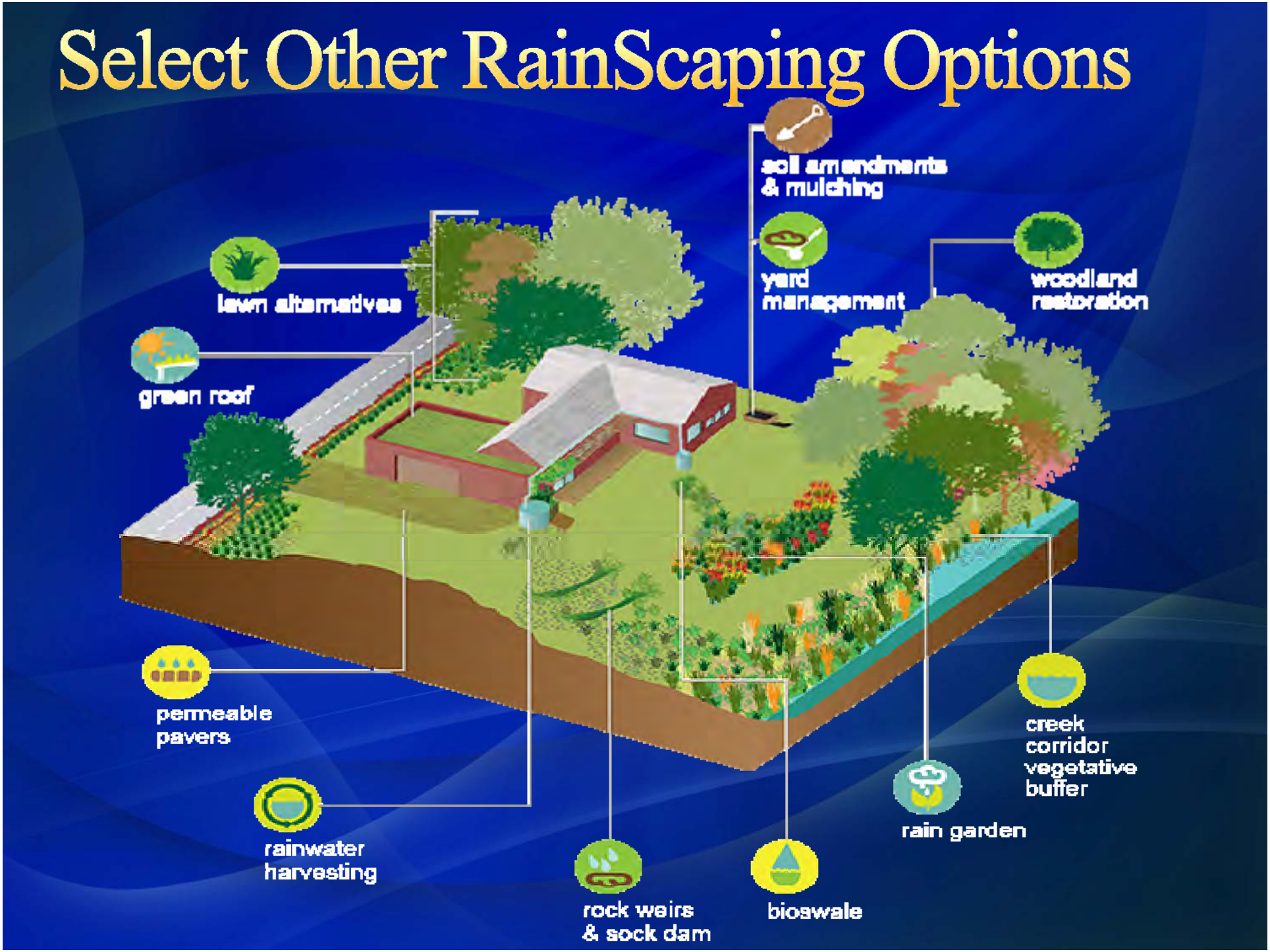
**4. Check the depth of water with a ruler every hour for at least 4 hours.**

**A rate of .25 to 1.5 inches/hour is considered adequate to ideal for a rain garden**

# Options:

- Amend the soil with compost
- Use an auger to drill holes and fill with compost
- Find a more well-draining site for the rain garden
- Consider a different rainscaping option

# Select Other RainScaping Options



# RainScaping Guide: Soil Amendments & Mulching

## Amending Soil to Improve Infiltration Rates

Incorporating compost-amended topsoil, well-aged compost, calcined clay and/or expanded shale, are recommended strategies for improving soil infiltration rates. In addition, topping the garden with annual application of organic mulch is a key ingredient for reducing compaction and improving soil quality and infiltration capacity. This will, in turn, improve plant growth and root systems which increase the ability of the soil to absorb water over time.

Adding sand in insufficient quantities can result in a concrete-like soil texture that does not drain; therefore adding sand is NOT recommended.

For more detailed soil amendment and mulching recommendations see Conquer Compacted Soils.

For guidance on fertilizing your yard see Fertilizer Management.

Click on a landscaping option from the graphic below to learn more about that topic:

RainScaping Quick Links

What is RainScaping?

Why RainScape?
- *Benefits & Goals*

How to RainScape
- *What Do You Know About Your Site?*
- *Is a Rain Garden Right for Your Site?*
- *Design & Build a Rain Garden*
- *Select Other RainScaping Options*
- *Select Plants*

Landscaping Options:
- *Lawn Alternatives*
- *Soil Amendments & Mulching*
- *Yard Management*
- *Woodland Restoration*
- *Creek Corridor Vegetative Buffers*
- *Rain Gardens*
- *Vegetated Bioswales*
- *Rock Weirs & Sock Dams*
- *Rainwater Harvesting*
- *Permeable Pavement*
- *Green Roofs*

Resources

*The Missouri Botanical Garden RainScaping Guide is partially funded by the Mabel Dorn Reeder Foundation and US EPA Region 7 through the Department of Natural*

# Amending Soil

- NO sand
- Mulch
- Well-aged compost
- Topsoil (silt loam only)
- Mycorrhizal innoculant
- Calcined clay “Turface”
- Expanded gypsum
- Aeration backfilled with compost
- Tilling
- Plants with robust root structures

# Design and Build Rain Garden

- Is a Rain Garden Right for Your Site?
- Determine Rain Garden Size & Depth
- Decide Which Rain Garden Elements to Include
- **Organize Water Flow**
- Select Plants
- Gather Tools & Supplies
- Lay It Out & Dig In
- Plant the Rain Garden
- Maintain the Rain Garden

## Organize Water Flow

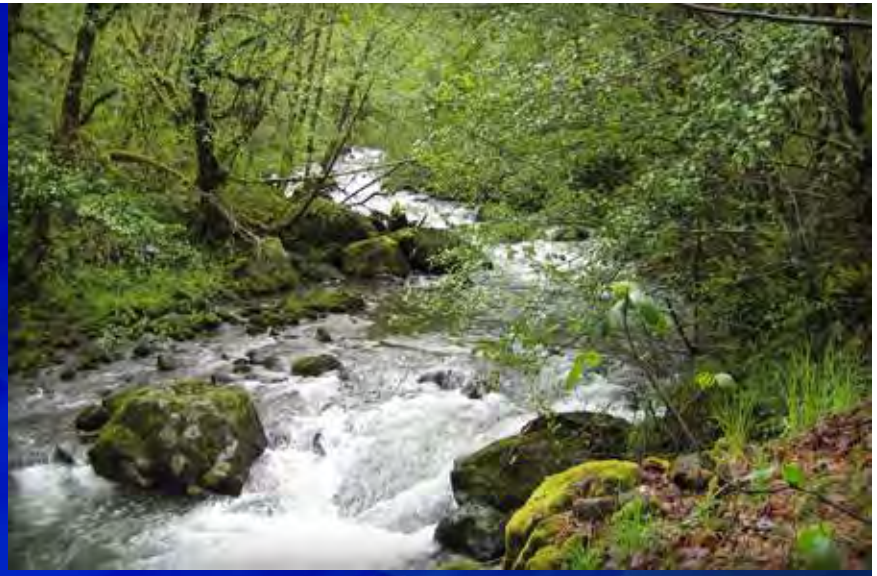
Several options exist when deciding how to direct water into the rain garden:

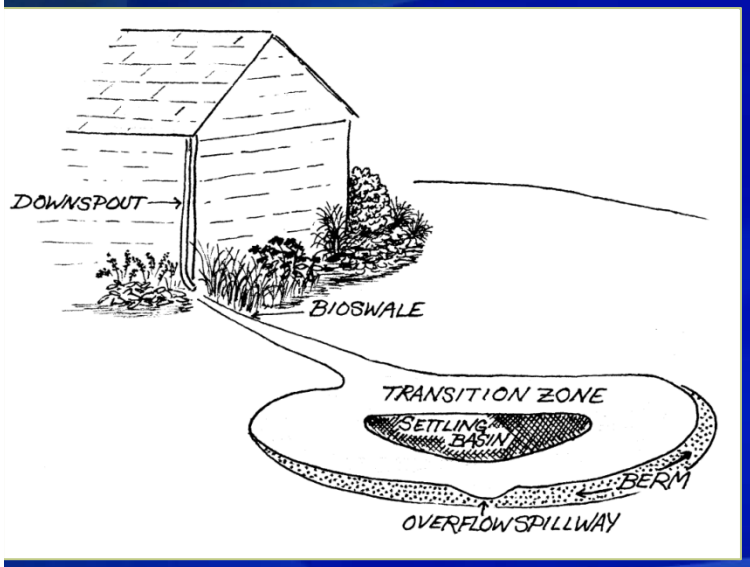
- When designing a rain garden to manage runoff from the roof, redirect your gutter downspout(s) to point towards your rain garden and reroute the water through an underground pipe or a bioswale.
- If a rain barrel has been installed on the gutter downspout, redirect the overflow from the rain barrel to the rain garden through an underground pipe or a bioswale.
- In some cases, the topography of the property allows for a natural flow of water. Take advantage of this when designing a rain garden and/or bioswale.
- Be sure to reinforce the area where water enters the rain garden if there is a potential for erosion with erosion netting and/or stone.
- It may be a good idea to leave your rain garden "off line" for an initial period. By allowing time for your plants to become well-established in your rain garden before redirecting gutter downspouts or adding the directional pipe or bioswale to route water to your rain garden, the plants will become strong and tall enough to withstand flooding.

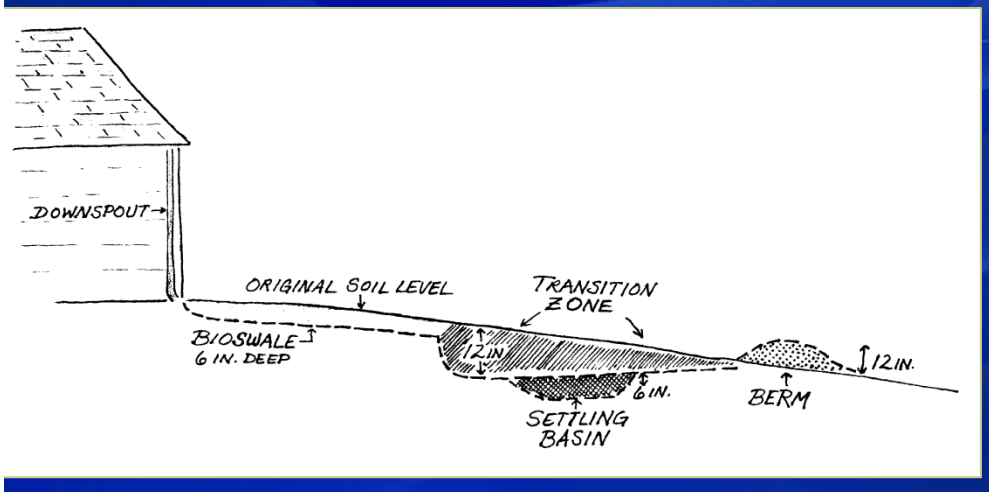
▸ *Continue on to Select Plants*

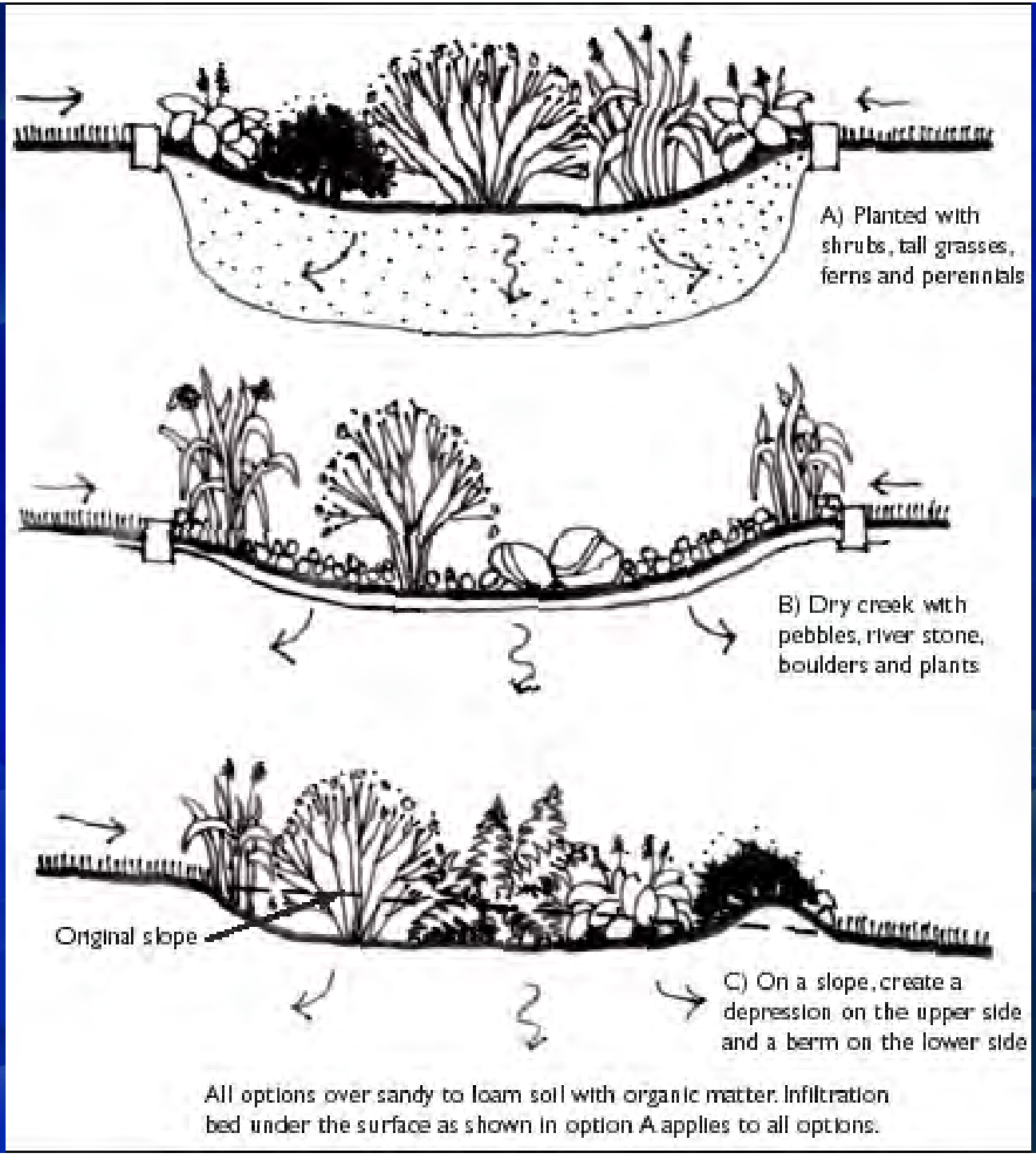
# What is a rain garden?

## A rain garden mimics natural watersheds and wetlands





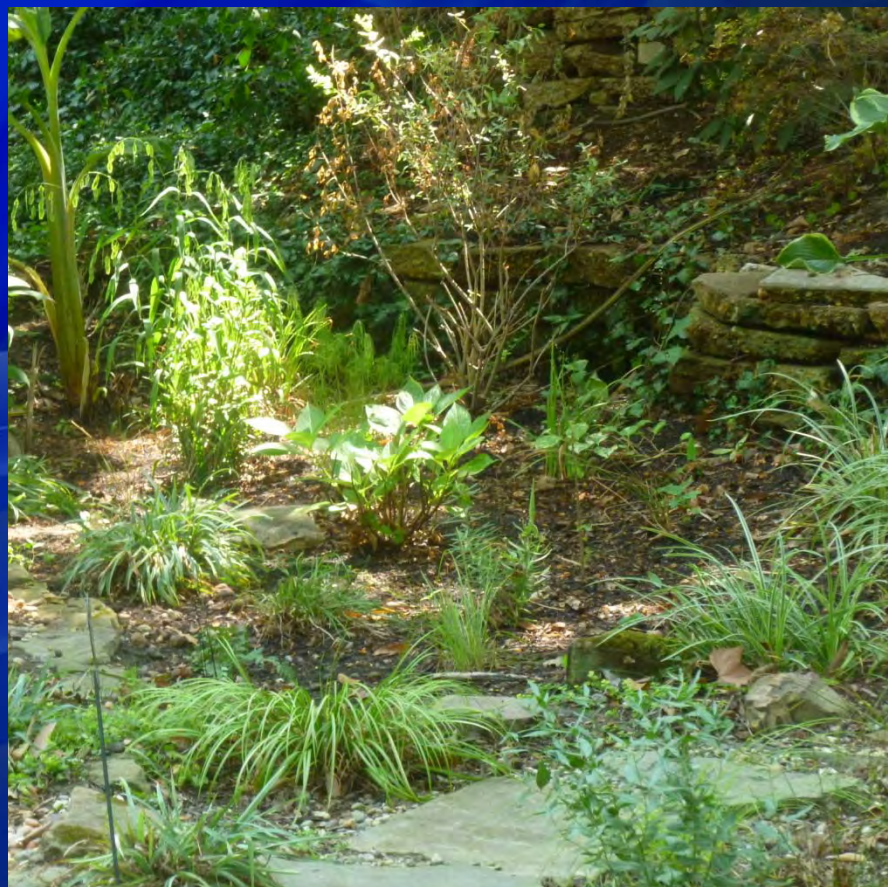




A) Planted with shrubs, tall grasses, ferns and perennials
B) Dry creek with pebbles, river stone, boulders and plants
Original slope
C) On a slope, create a depression on the upper side and a berm on the lower side
All options over sandy to loam soil with organic matter. Infiltration bed under the surface as shown in option A applies to all options.

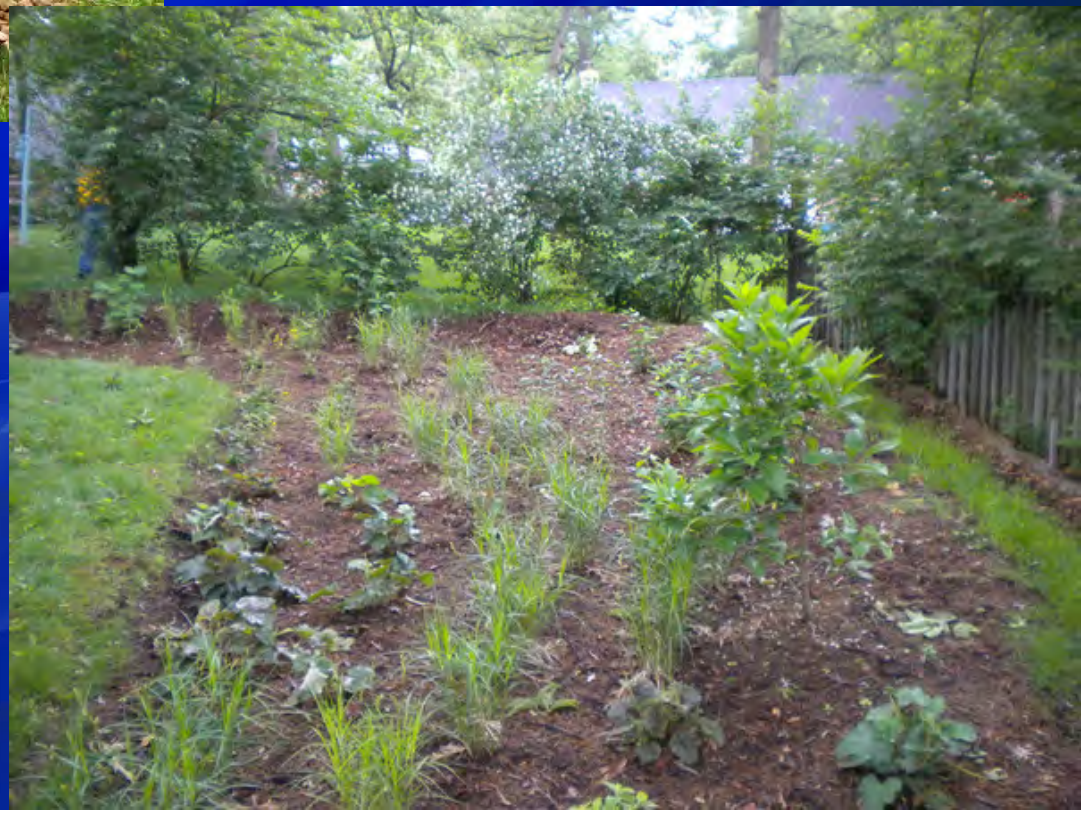

B) Dry creek with
pebbles, river stone,
boulders and plants

Great way to get water across driveway to rain garden or other option

# Rain gardens have a basin that is obvious -- otherwise it is a lawn alternative



Listed as a rain garden but was too close to the house and is a basin filled with stone not plants

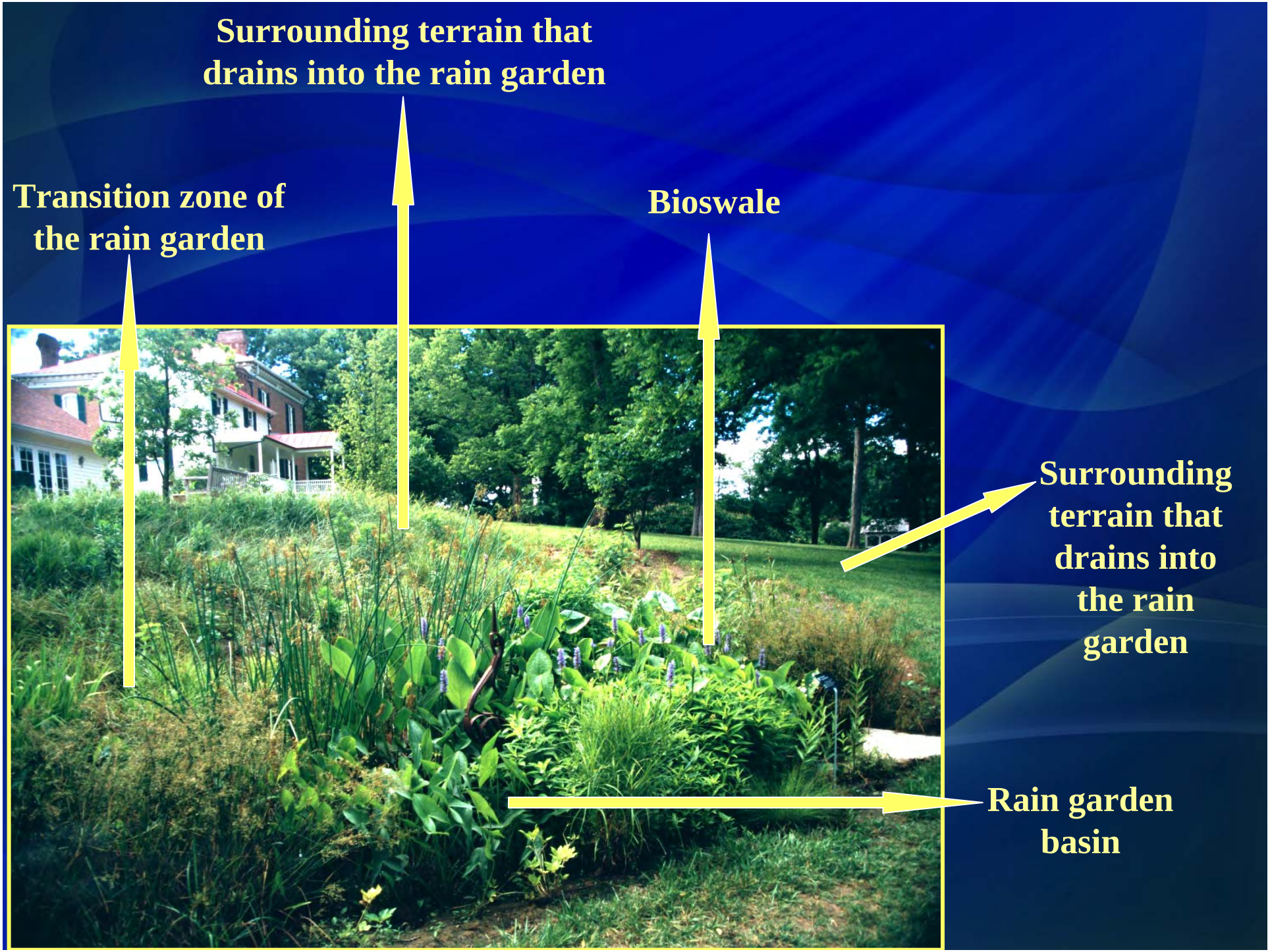


# Rules of Thumb For Rain Gardens

- Locate rain garden perpendicular to flow of water and near the source
- Always protect soil from compaction and erosion
- Basin should be 4-8”
- Size =approx. 20-30% of surface draining towards rain garden
- A rain garden should be no closer than 10 ft. from a building
- Do not add sand to native soil (sand + clay + lime = bricks!)
- Do not disturb tree roots – protect the trees!
- Do not build in low area or over septic systems/sinkholes
- More clay, less drainage=larger rain garden or make soil more permeable. OR-find a more suitable location or option.
- Grade to ensure that water flows from source to rain garden

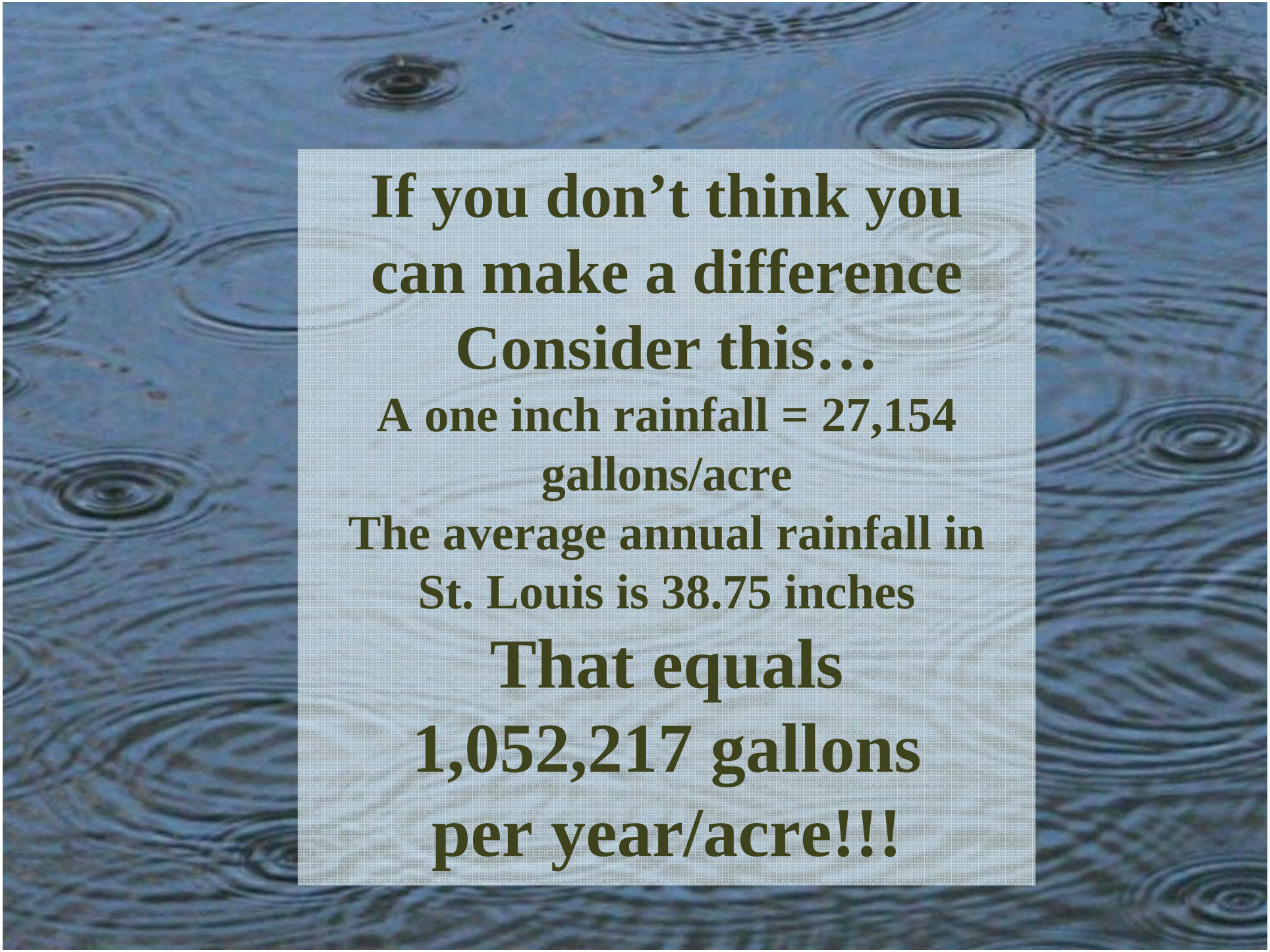
# More Rules of Thumb!

- Use biodegradable erosion blanket where needed
- Install a temporary bypass during establishment phase of rain garden and/or bioswale
- Protect area from siltation
- Use permanent erosion blanket and gravel/stone in areas of high energy water flow


Surrounding terrain that drains into the rain garden
Transition zone of the rain garden
Bioswale
Surrounding terrain that drains into the rain garden
Rain garden basin

**Rain gardens of any size will reduce the quantity and velocity of storm water runoff.**

***Any reduction is a benefit!***


If you don't think you can make a difference
Consider this…
A one inch rainfall = 27,154 gallons/acre
The average annual rainfall in St. Louis is 38.75 inches
That equals
1,052,217 gallons per year/acre!!!

# Design Styles

## Reconstructed wetlands?

**Naturalistic?**
**Traditional?**
**Formal?**

# Maintenance of Rain Gardens

- Keep the input and overflow clean and free of debris
- Check periodically to be sure the rain garden is draining and there is not an impermeable “crust” on the surface
- Don’t use inorganic fertilizer, use compost
- Don’t use pesticides

*Basic maintenance is the same as any other garden*:

- Water during establishment and during drought
- Maintain a 2-4” layer of organic mulch
- Keep garden/bioswale weeded at all times
- Remove any dead and/or unsightly plant parts
- Don’t remove dormant plant parts until early spring
- Always maintain a clean edge

# Sample Maintenance Schedule

| MONTH(S) | MAINTENANCE | WEEKLY | MONTHLY |
|---|---|---|---|
| Jan-Feb | Check for and remove trash and debris | X | |
| Mar-May | Remove dead plant parts; replace any mulch where needed; thin any crowded/overgrown plants | | X |
| | Check for erosion & excessive ponding **during storms** | as | needed |
| | Weed; water during drought; tidy up garden as needed | X | |
| | Plant/replant as needed | X | |
| June-Aug | Check for erosion & excessive ponding **during storms** | as | needed |
| | Weed; water during drought; tidy up garden as needed | X | |
| Sept-Oct | Check for erosion & excessive ponding **during storms** | as | needed |
| | Weed; water during drought | X | |
| | Plant/replant as needed | X | |
| | *Check pH 1x/year-adjust if necessary as indicated by test | | *1x/yr |
| Nov-Dec | Replace mulch where needed | | X |

# Sample Maintenance Schedule

## WEEKLY: in season

- Weed
- Water as needed
- Check for and fix erosion
- Keep a tidy look in the garden(s)
- Inspection for good general appearance of area/gardens

## MONTHLY

- Clean out any trash, debris etc., esp. at input/output of rain gardens & bioswales

## SPRING & FALL

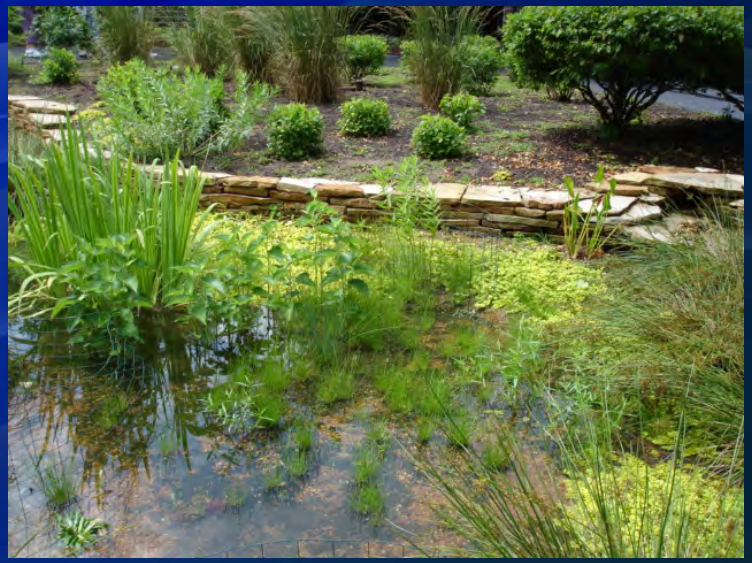
- Replace mulch where needed
- Plant/replant as needed
- Scratch surface to prevent 'crust'

## ANNUALLY

- Check pH; adjust as indicated

Always maintain a clean edge to give a finished, ‘garden’ look

Add elements that indicate intention



Sturtevant, WI



# RAIN GARDEN
## DEMONSTRATION PROJECT

**Raingardens treat and infiltrate stormwater, protect water supplies & reduce pollution to surface waters.**

*Designed and Built by Employees of*
**Comprehensive Environmental Inc.**

*For more information*
**www.ceiengineers.com**


Springfield, MO

# Select Plants

# What considerations determine plant choices?

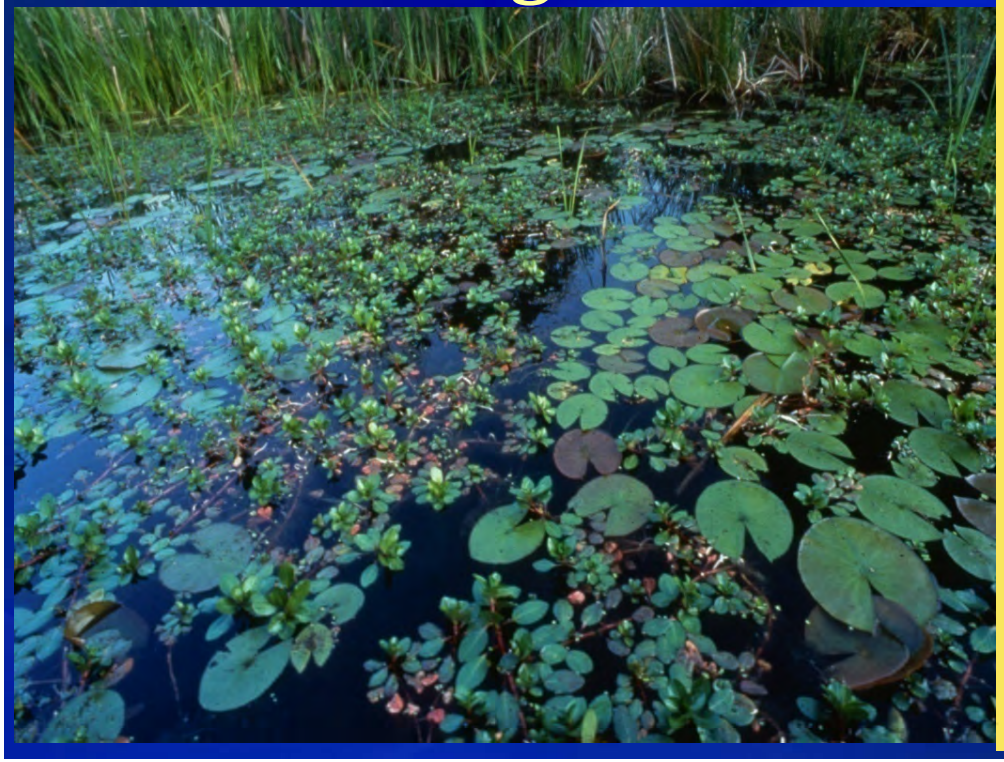
- **Rain gardens consist of different moisture zones, therefore your plant list for each zone will be different**
- **Size of project and budget will determine container size**
- **Native or non-native plants or both?**
- **Seeding vs. planting or both?**

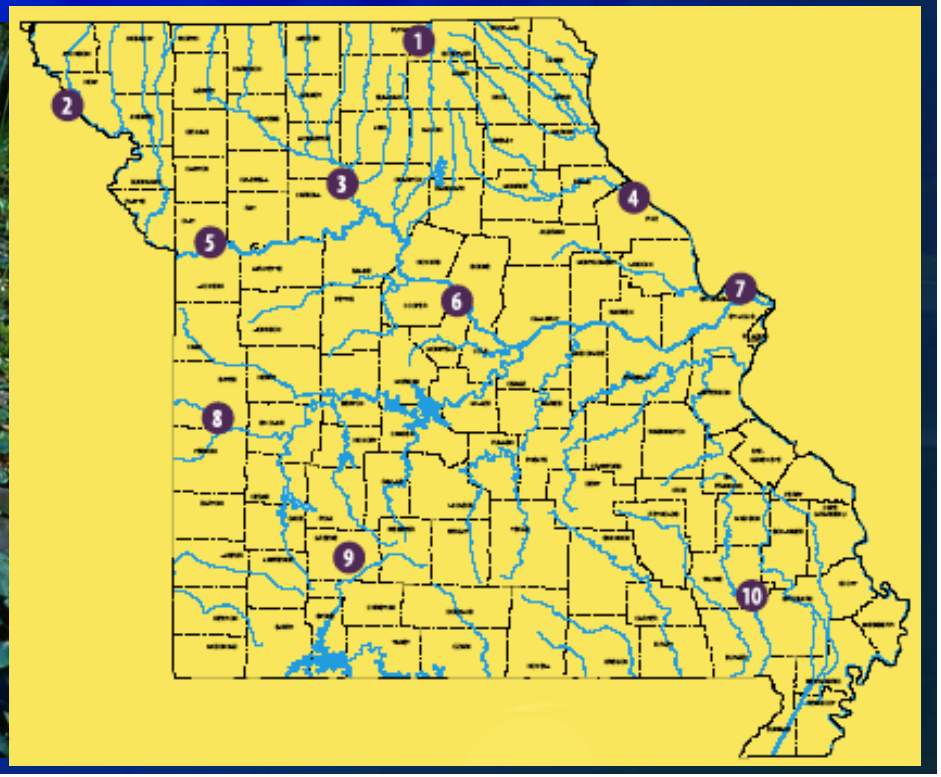
## Why choose native plants vs. non-native plants?

- Native plants enhance the habitat value of your property
- Native plants are well-adapted to the fluctuations in climate

***The plant list does not determine the design style—the gardener/designer does!***

**Native wetland plants are well adapted to periods of flooding followed by periods of drought…**





# Location – dry vs. moist - determines plant choices

upper slope

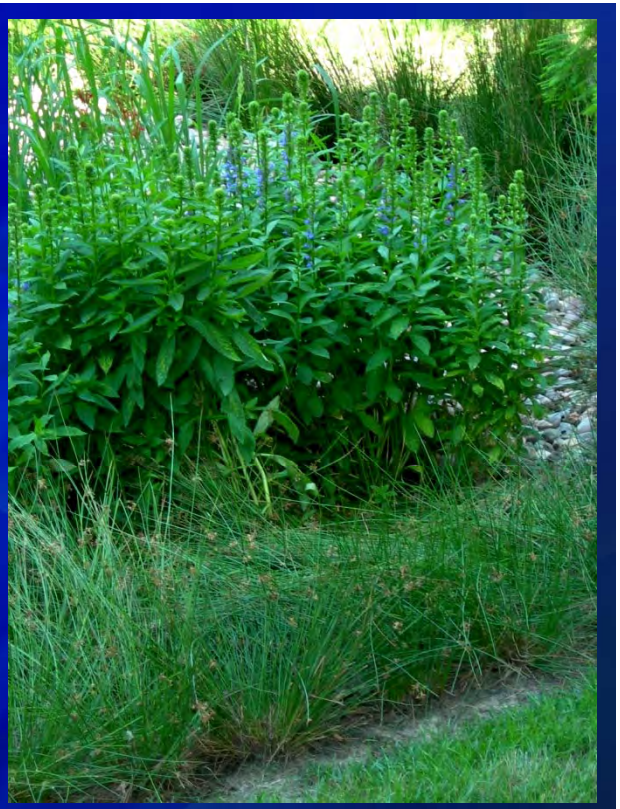
lower slope

pond edge- seasonal inundation

permanently submerged

# Contrast foliar texture and plant form

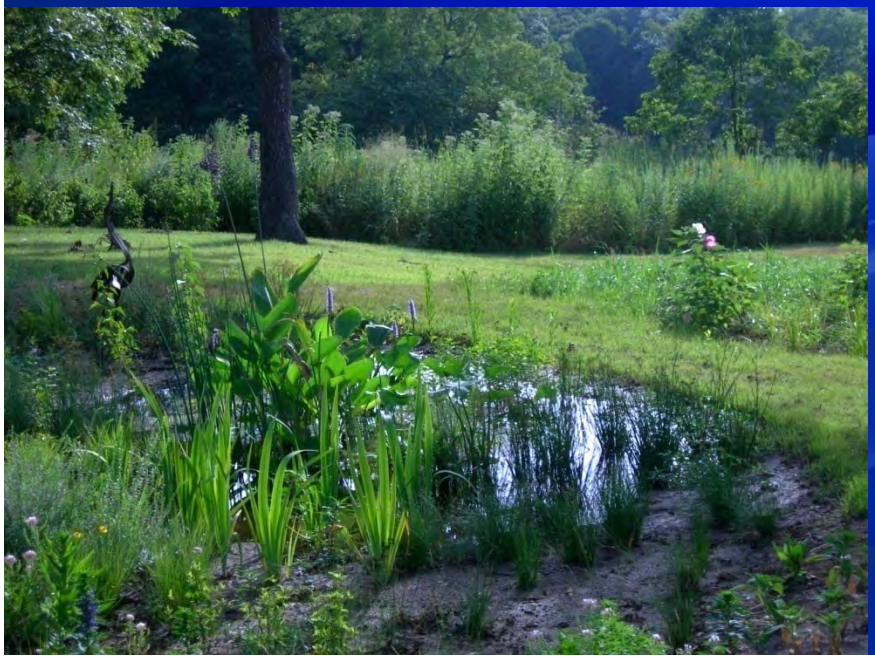
**Choose plants with different bloom times**



Some top plants to use
in rain gardens
in sunny locations

***In the basin…and on lowers slope***

Sedges (*Carex* )
Rushes (*Juncus/Scirpus* )
Spike rushes *(Eleocharis)*



# Bluestar
## *Amsonia illustris*

**Swamp/marsh milkweed**
***Asclepias incarnata***

Rose mallow -
*Hibiscus lasiocarpus*

**Blue flag iris -**
***Iris virginica***

**Copper iris -**
***Iris fulva***

Cardinal flower (*Lobelia cardinalis*)

Blue lobelia - *Lobelia siphilitica*

**Switch grass**
**(*Panicum virgatum*)**

# Yellow coneflower - (*Rudbeckia fulgida*)

# Shade species

**Golden groundsel**
***Senecio aureus***

**Cardinal flower**
***Lobelia cardinalis***

**Most sedges are shade tolerant**

# Ferns

Royal fern
(*Osmunda regalis)*

Sensitive fern (*Osmunda sensibilis)*

Ostrich fern
(*Matteuchia struthiopteris*)

# A Few Shrubs & Small Trees

Ilex verticillata - winterberry

Hamamelus – witch hazel

Aesculus pavia – red buckeye

**Cephalanthus- buttonbush**