

Addressing Drainage Issues with Native Plants

Deep Roots, April 27, 2021

by David Dods



Agenda

1. How water moves through the natural landscape
2. How water moves through the urban landscape
3. Erosion
4. Choosing plants for stormwater projects
5. Example problems and solutions



How water moves through the natural landscape

Stormwater Key Point 1:

Stormwater is
affected by

Water



Earth



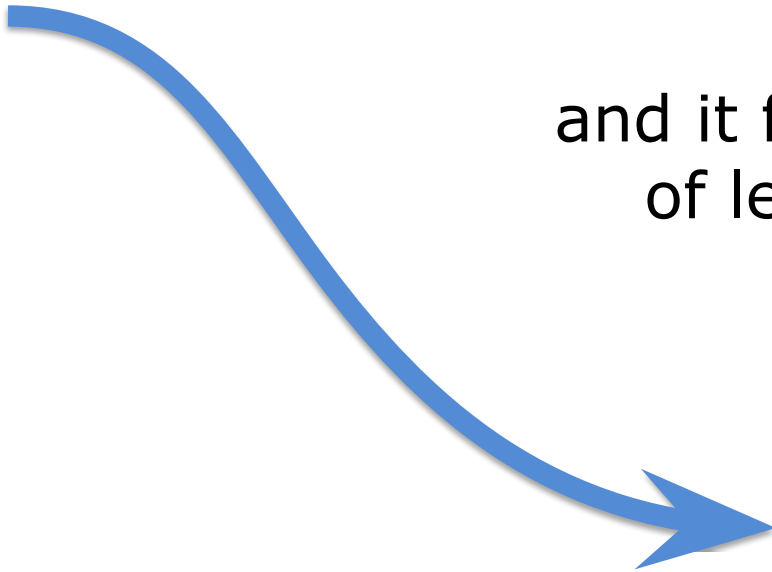
Plants

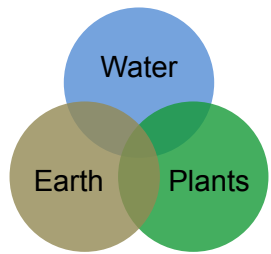


Stormwater Key Point 2:

Water flows downhill,

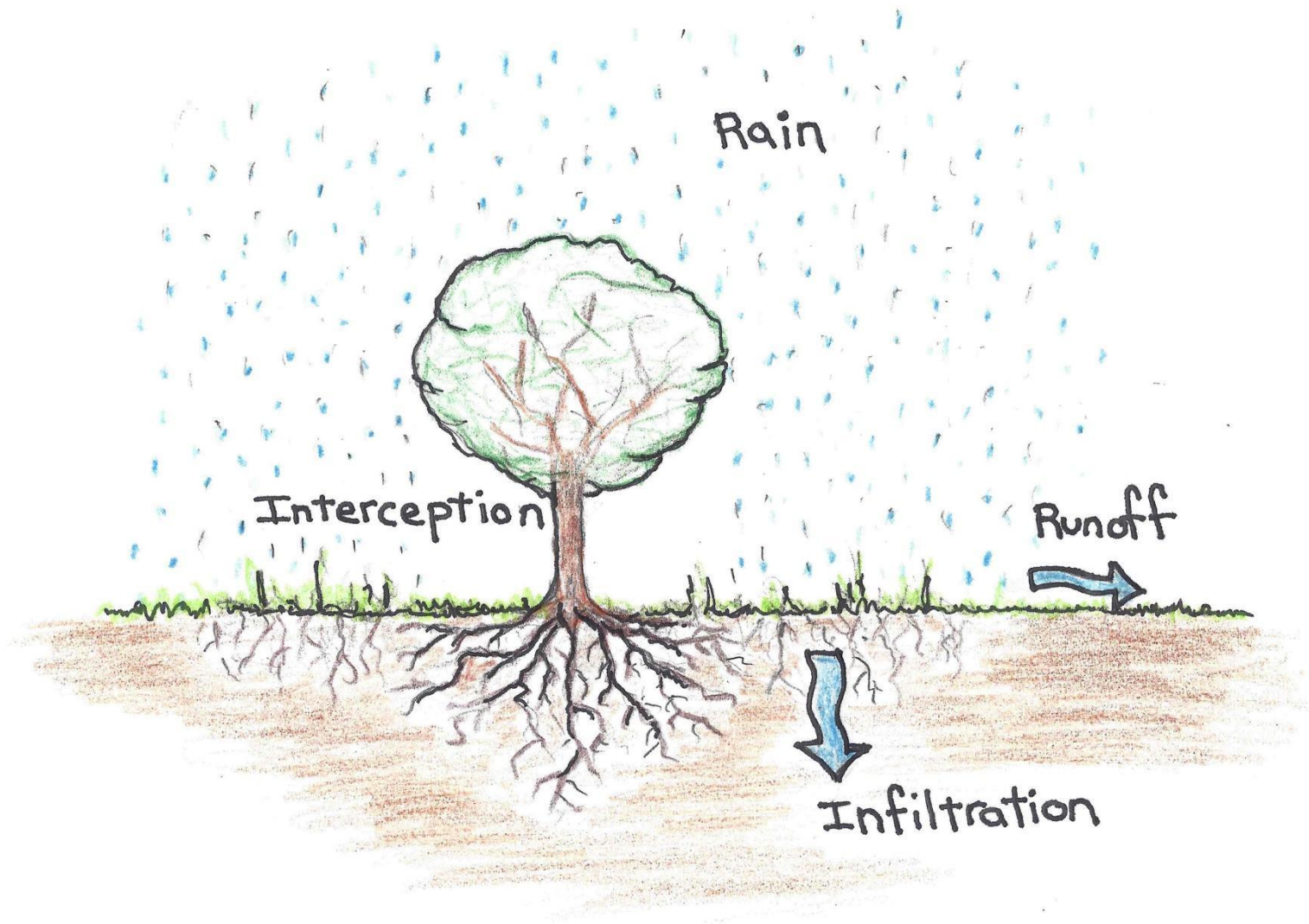
and it follows the path
of least resistance





R.I.I.R

Rain, Interception, Infiltration, Runoff

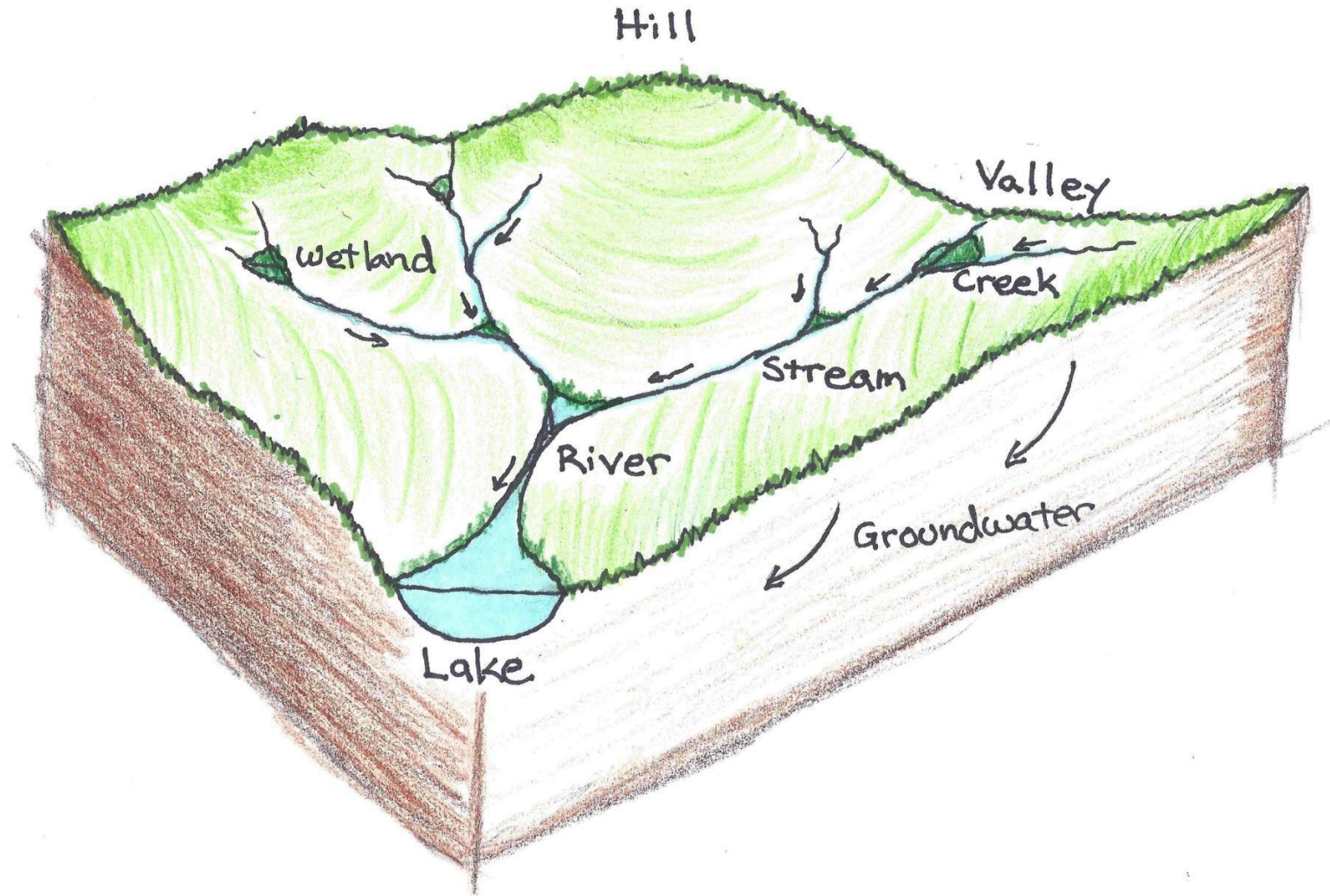


Native Prairie





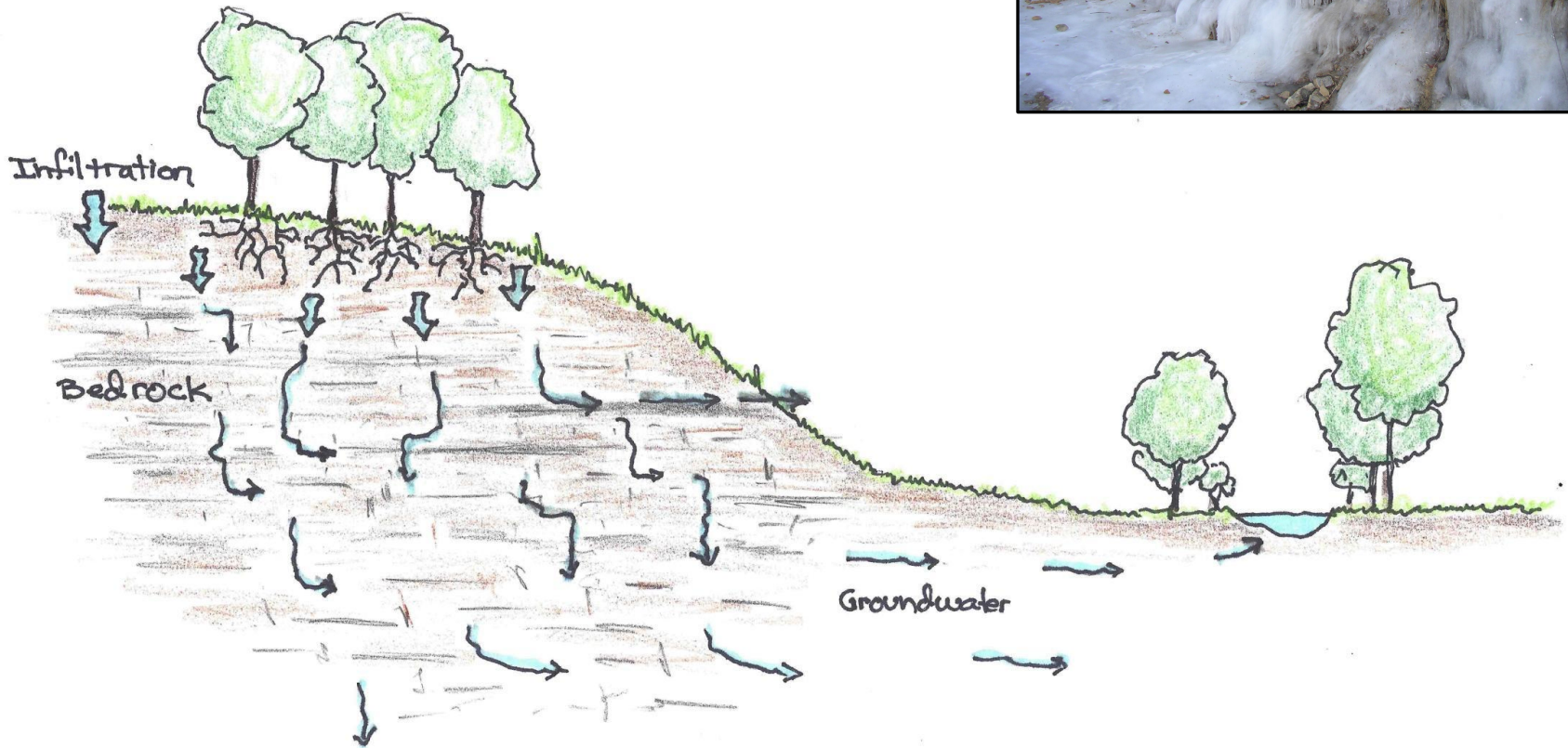
How Water Moves Through the Landscape: Natural Watershed



View Beneath a Kansas City Hillside



Water Seepage Through a Kansas City Hillside





Water Moves Slowly

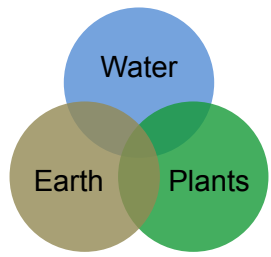
Forest – Wetland - Creek - Stream

What prevents erosion,
as the streams get bigger,
and the water flows faster?





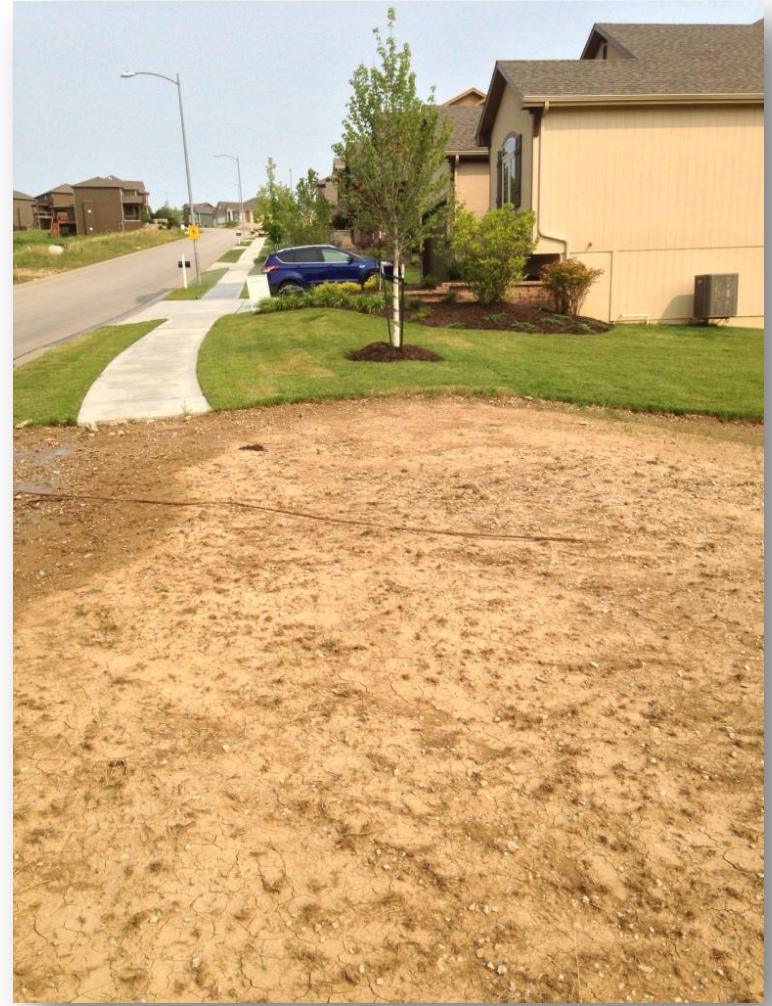
How water moves through the urban landscape



The Suburban Ecosystem



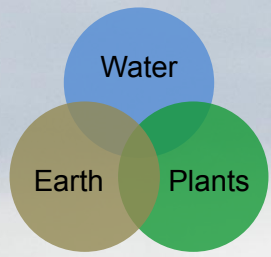
Suburban Soil



R.I.I.R in this Yard

Rain, Interception, Infiltration, **Runoff**





The Suburban Watershed





The yard at the bottom of the hill

Another Suburban Watershed





Forest – Wetland - Creek

is now...

Roof - Driveway - Storm Sewer



How much runoff we you get when it rains?

1 inch of rain
on 1 sq ft

= 0.6 gallons

1 inch rain

1500 sq ft roof = 900 gal

$\frac{1}{4}$ acre lot = 3,000 gal

5 inch rain

$\frac{1}{4}$ acre lot = 15,000 gal

10 acre neighborhood =
1,000,000 gal



Consequences: Flooding



Photo: David Dods

Consequences: Erosion



Erosion



Erosion Basics

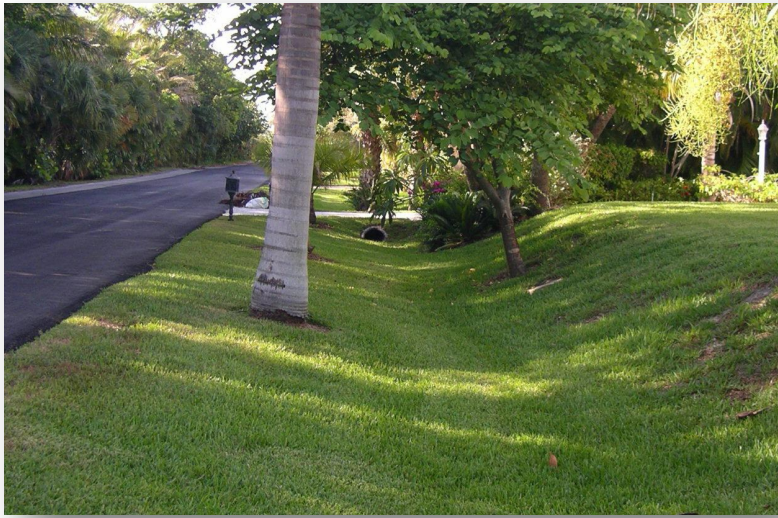
Bare soil erodes,
even on mild slopes



Soil with vegetation erodes, if:

- vegetation has gaps,
- slope is steep,
- soil is soft





Dense
Turf

Drainage Channels:
Erosion prevention is key
When conveying moving water



Rock



Rock + Plants:
Sedges and iris

Drainage Channel Key Points

Shape:
"U" Shape keeps water
in center of channel

Rock:
Use bigger rock for fast flows,
or steep slopes.
Choose heavy rock.





Choosing plants for stormwater projects:

- 1 - Planting zones
- 2 - Growth habit

Planting Zones: Pond



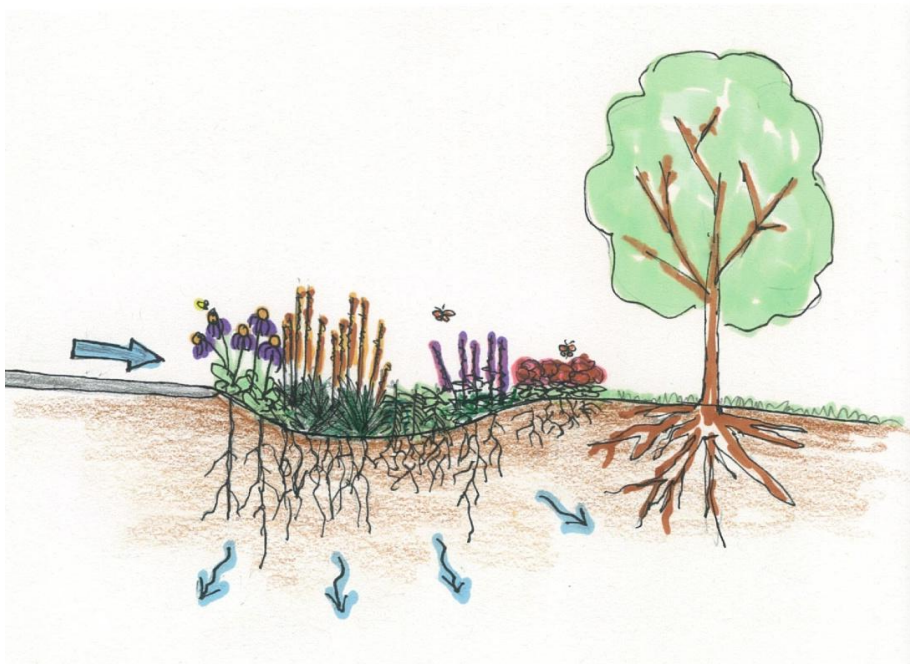
Bottom:
Standing water

Side: Moist
Floods then dries out

Top Edge:
Dry

Planting Zones: Rain Gardens

Catch stormwater runoff; Slow it, Soak into soil



Edges:
Dry

Bottom: Moist
Floods occasionally, then dries out

Growth Habit: Clump Forming Plants



Sedges

Many choices for moist to wet locations,
Most are clump forming



Little Bluestem

Bunch grass for dry locations

Clump Forming

OK when water flow is slow



For Erosion Control: Plant Dense + Interplant



Moist:
Iris Between Sedges



Dry:
Buffalo Grass + Flowers
Between Bluestem

Growth Habit: Spreading

For erosion control



Switchgrass
Spreads aggressively



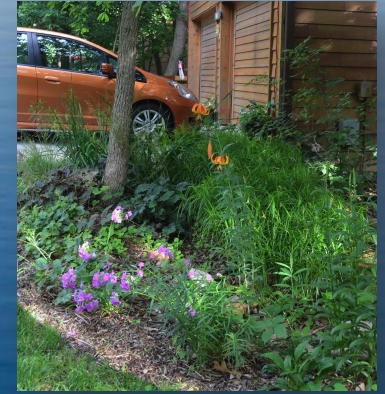
River Oats
Spreads aggressively

Erosion Control: Heavy Seeders

Spread to fill in bare spaces,
But it takes several years

Rudbeckia
Coreopsis
Asters
Coneflowers
Monarda
Goldenrod





Example Problems and Solutions

How Do We Manage Stormwater...

to get this:



to function more like this:



1. Catch and Conserve
2. Slow and Soak
3. Control the Flow

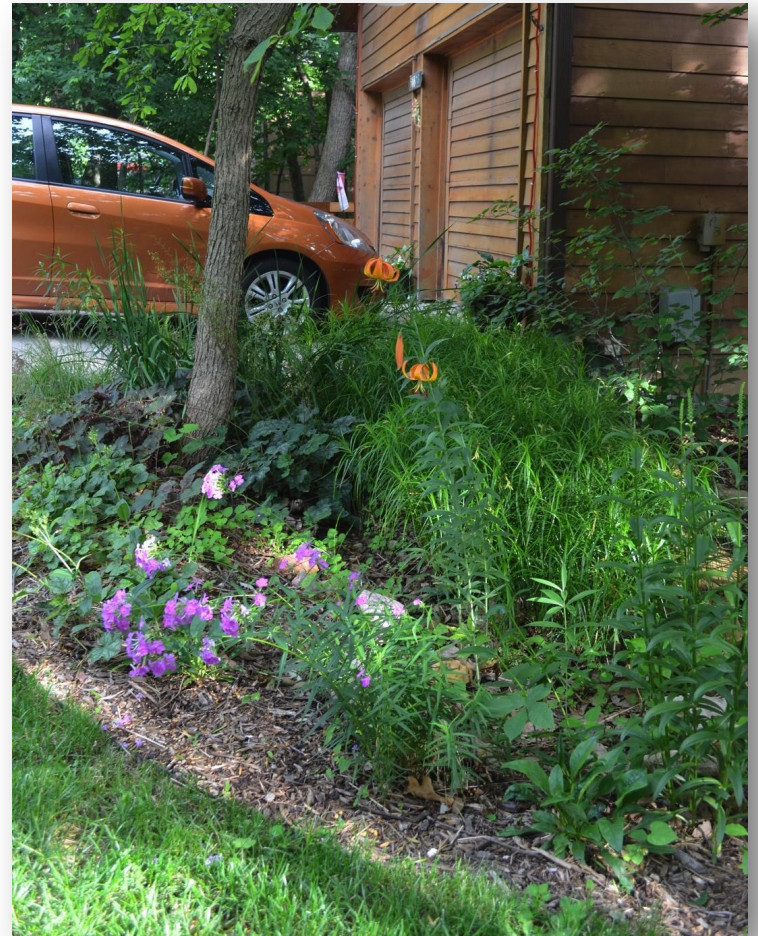
Catch and Conserve:

Catch runoff near the source. Save water for a dry day.

Roof runoff – Rain barrels



Driveway – rain garden



Slow and Soak

Restore Habitat & Soil
Reduce Lawn





Control the Flow
Convey moving water
without erosion

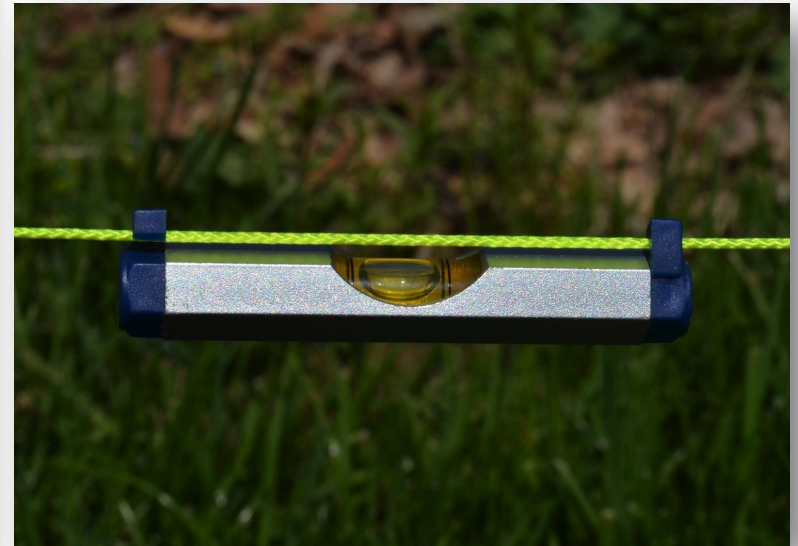


Preventing Water in Basement



How to Measure the Slope of Your Yard

String Level



After You Get Water Away from the House, Slow and Soak it with a Rain Garden



Downspout Drainage in a Sloped Yard

Downspout

Pipe under
sidewalk





Staking Location for a Raingarden Terrace

Drain pipe,
Rocks for splash pad



Bed shape



- Blue lobelia
- Blue flag iris
- Ohio spiderwort
- Soft rush
- Purple coneflower





Rain Garden/Pollinator Garden

Low Point in Yard Where Downspouts Drain



Rain Garden

Catch stormwater drainage from roof and sidewalk



Virginia sweetspire
Switchgrass (cultivar)
Sedges
Blue flag iris

Sump Pump Drain Point



Parking Lot and Driveway Edge

Bottom: Moist

Palm sedge
Marsh milkweed
Blue flag iris
Prairie blazingstar

Sides:

Average to Dry

Purple coneflower
Black-eyed Susan
Little bluestem
Downy phlox



Narrow Side Yard

Rock channel directs downspout drainage to garden in back yard



Very Narrow Yard – Row Houses

Rain garden in a planter box, Philadelphia



When Half the Neighborhood Drains Through Your Yard

Water is coming from upstream

A raingarden alone won't solve the problem

Routing the drainage + erosion control is needed



Neighbors Need to Work Together to Solve These Problems

Don't just aim your drainage at the next yard

Slow and catch water in each yard

Contact City if street drainage or sewers are backed up



Neighborhood Common Space

Densely vegetated swale



Photo: Rice Creek Watershed District



Average to moist prairie grass mix
Planted above the rocks

Shade tolerant shrubs
Planted around the rocks
Ninebark, gooseberry, gray dogwood

Streambanks: Plants + Rock Work Together to Control Erosion



Pond Edge Eroding by Road



Lined drainage gully with rock

Terraced with available materials

Planted densely with plugs + seed
Considered planting zones up the slope

Coreopsis, prairie dropseed (dry)

Purple coneflower, Black-eyed Susan (average)

River oats, Palm sedge (moist)

Soft rush (wet)



Homeowner Now Plans to Catch, Conserve, Slow, & Soak



Native Plants for Soggy Spots

Kansas City Area & Midwest

Common Name	Latin Name	Moisture				Sun / Shade			Notes
		Dry	Avg	Moist	Wet	Full Sun	Part Shade	Full Shade	
Sedges/Rushes/Grasses									
Palm sedge	<i>Carex muskingumensis</i>		████████████████████			████████████████			Greens up early in spring. Hardy plant tolerates a range of conditions
Gray's sedge	<i>Carex grayi</i>		████████████████████			████████████████			Interesting star shaped seed heads
Emory's sedge	<i>Carex emoryi</i>			████████████████		████████████████			Prefers consistently moist conditions
Frank's sedge	<i>Carex frankii</i>			████████████████		████████████████			Prefers consistently moist conditions
Tussock Sedge	<i>Carex stricta</i>			████████████████		████████████████			Need consistently moist to wet conditions. Forms mounds, spreads by rhizomes
Fox sedge	<i>Carex vulpinoidea</i>			████████████████		████████████████			Need consistently moist to wet conditions. Can spread
Soft rush	<i>Juncus effusus</i>		████████████████████			██████████████			Evergreen foliage, but with pointy ends
River oats	<i>Chasmanthium latifolium</i>	████████████████████				██████████████			Spreads aggressively. Good for erosion control, but will take over a garden bed
Switchgrass	<i>Panicum virgatum</i>	████████████████████				██████████████			Spreads aggressively. Good for erosion control, but will take over a garden bed

Native Plants for Soggy Spots

Kansas City Area & Midwest

Common Name	Latin Name	Moisture				Sun / Shade			Notes	
		Dry	Avg	Moist	Wet	Full Sun	Part Shade	Full Shade		
Flowers										
Marsh milkweed	<i>Asclepias incarnata</i>								Moist loving milkweed. Use in bottom of raingardens.	
Southern blue flag iris	<i>Iris virginica</i>									Moist loving iris. Good for erosion control
Prairie blazing star	<i>Liatris pycnostachya</i>								Great for butterflies and pollinators	
Blue lobelia	<i>Lobelia siphilitica</i>								Tall blue flower stalks	
Joe pye weed	<i>Eutrochium purpureum</i>								Great butterfly plant, but 6-8 ft tall. Good for back border	
Black-eyed Susan	<i>Rudbeckia fulgida, var. sullivanti</i>								Forms clumps and spreads over time. Good in erosion control.	
Purple coneflower	<i>Echinacea purpurea</i>								Popular with bees in summer. Finches like the seeds in fall. Readily spreads.	
Foxglove beardtongue	<i>Penstemon digitalis</i>								Spring bloomer. Tubular white flowers	
Indian pink	<i>Spigelia marilandica</i>									Red flowers attract hummingbirds
Golden ragwort	<i>Packera aurea</i>									Ground cover for shady moist locations
Wild Sweet William	<i>Phlox divaricata</i>									Attractive early spring bloomer
Wild ginger	<i>Asarum canadense</i>								Great groundcover for shady moist areas	

Native Plants for Soggy Spots

Kansas City Area & Midwest

Common Name	Latin Name	Moisture				Sun / Shade			Notes
		Dry	Avg	Moist	Wet	Full Sun	Part Shade	Full Shade	
Shrubs									
Black chokeberry	<i>Aronia melanocarpa</i>		████████████████████			████████████████			White flowers in spring, red leaves in fall
Ninebark	<i>Physocarpus opulifolius</i>	████████████████████	████████████████████			████████████████			Very hardy, large shrub. White flowers, attractive arching stems with peeling bark.
Red buckeye	<i>Aesculus pavia</i>		██████████████			████████████████████			Large shrub to small tree. Red flowers
Spicebush	<i>Lindera benzoin</i>		██████████████				██████████████		Host plant for spicebush swallowtail
Trees									
River birch	<i>Betula nigra</i>		████████████████████			████████████████			Yellow in fall. Attractive bark. Grows fast
Bald cypress	<i>Taxodium distichum</i>		████████████████████			██████████████			Attractive conifer, drops leaves in winter
Swamp white oak	<i>Quercus bicolor</i>			██████████████		██████████			Oak tree for low, wet locations
Black gum	<i>Nyssa sylvatica</i>			██████████████		████████████████			Beautiful orange-red leaves in fall
Ozark witch hazel	<i>Hamamelis vernalis</i>		██████████████			████████████████			Understory tree. Yellow leaves in fall. Blooms late winter

Resources

NATIVE PLANTS

Deep Roots. Native plant resources and education. <https://deeprroots.org/>

STORMWATER

The Blue Thumb Guide to Raingardens: Design and Installation for Homeowners in the Upper Midwest, by Rusty Schmidt, Dan Shaw, and David Dods.

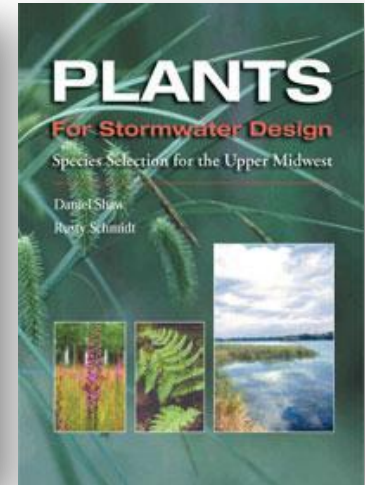
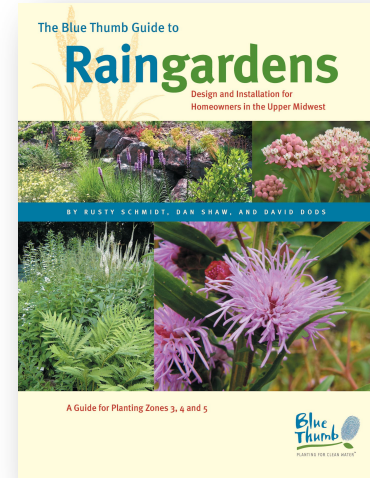
<http://www.terracehorticulturalbooks.com/>

Plants for Stormwater Design, by Daniel Shaw and Rusty Schmidt. Free online PDF.

<https://www.pca.state.mn.us/water/plants-stormwater-design>

Blue Thumb Partners. Minnesota based non-profit. Online resources for raingardens, shoreline planting, alternative lawns.

<https://bluethumb.org/>



Moist to Wet
Locations:
Garden Bottoms

Sedges are Great
Foundation Plants

Palm Sedge
Carex muskingumensis
(ave - moist)



Cedar Sedge
Carex eburnia
(dry - ave)

Tussock Sedge
Carex stricta
(moist - wet)





A Versatile Sedge

Palm Sedge

Carex muskingumensis

- Sun – med shade
- Ave – wet
- Greens up early
- Tolerates drying
- Mudpie's go-to sedge

Sedges for Moist to Wet Locations

Consistent moisture needed



Gray's Sedge
Carex grayii

Interesting seed
heads



Tussock Sedge
Carex stricta

Can form large mounds
or tussocks



Frank's Sedge
Carex frankii

Tolerates part shade



Another Choice for Very Wet Locations

Soft Rush
Juncus effusus

- Ave – wet
- Tolerates saturated soil
- Semi-evergreen
- Pointy ends

Flowers: Moist to Wet Locations



Southern blue flag iris
Iris virginica

Spring bloomer



Marsh milkweed
Asclepias incarnata

Monarch favorite



Flowers: Moist Locations



Blue lobelia
Lobelia siphilitica

appreciates afternoon shade



Cardinal flower
Lobelia cardinalis

short lived
needs constant moisture & pm shade

Flowers: Moist Locations



Joe pye weed
Eutrochium purpureum
great butterfly plant; tall



Marsh blazingstar, *Liatris spicata* – moist
Prairie blazingstar (pictured), *Liatris pycnostachya* – average



Raingarden Sideslopes

Average moisture zone

Many flower
choices

Showy coneflower
Rudbeckia fulgida,
var 'sullivantii'



Garden Sides: Average Moisture



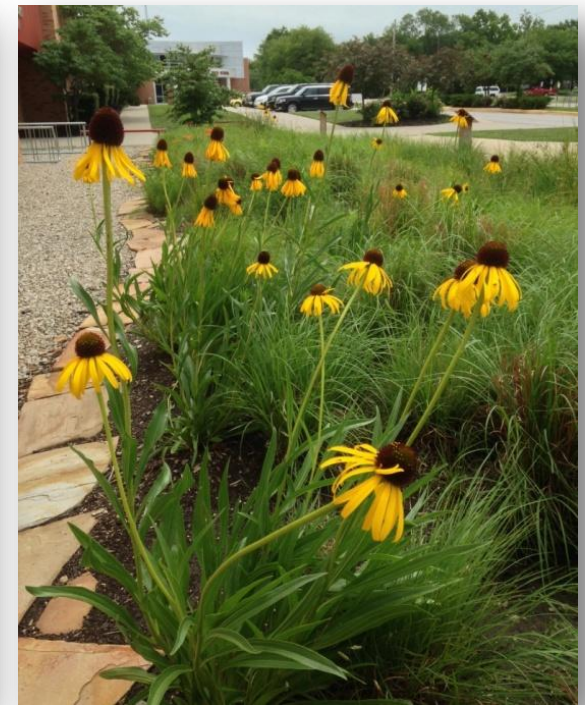
Foxglove beardtongue
Penstemon digitalis
(ave-moist)

Bumblebee favorite



Purple coneflower
Echinacea purpurea
(ave-moist)

Seeds for Goldfinch



Yellow coneflower
Echinacea paradoxa
(dry-ave)

Good cutting flower

Top Edges of Raingarden:

Use your favorites that like average to dry conditions



Downy phlox
Phlox pilosa
Spring nectar source



Butterfly weed
Asclepias tuberosa
Summer nectar source



Shady Areas

Many Woodland
Wildflowers Like Moist
Conditions

But not extended
saturation;
needs drainage

Shady Areas; Spring Bloomers



Wild Sweet William
Phlox divaricata



Celandine poppy
Stylophorum diphyllum

Shady Areas



Groundcover
Wild ginger
Asarum canadense



Small Tree
Red Buckeye
Aesculus pavia

Grasses for Moist Locations

Both spread aggressively.
Use for large landscapes or erosion control. Invasive in small gardens.



Switchgrass
Panicum virgatum



River Oats
Chasmanthium latifolium

Grasses Add Fall and Winter Color

These two work on sides or edges (ave – dry; not wet zones)



Little Bluestem
Schizachyrium scoparium

Prairie Dropseed
Sporobolus heterolepis

Shrubs for Raingardens Moist Locations



Black Chokeberry,
Aronia melanocarpa



Ninebark, *Physocarpus opulifolius*

Trees for Raingardens

Moist Locations



River birch
Betula nigra



Bald cypress
Taxodium distichum

Trees for Raingardens

Fall Color for Moist Locations



Black gum
Nyssa sylvatica



Witch hazel
Hamemalis vernalis