



Community Leadership for Clean Water

SESSION 6

RAINSCAPING DETAILS



Community Leadership for Clean Water

Contents

- Rain Barrel Details Construction and Installation
- Investigating Soils and Infiltration
- Understanding Raingarden Details
- Understanding Conveyance System Design
- Effective Plant Selection



Healthy Landscaping Practices

General Yard Practices

- ▣ Clean up pet and yard waste – Don't mow towards the street
- ▣ Shovel walks & drives promptly & avoid using excess salts
- ▣ Fertilize appropriately & raise mower blade to 3" height
- ▣ Water with intention – Don't set it and forget it
- ▣ Rethink the use of turf grass – Alternative plantings
- ▣ Rethink the definition of yard maintenance

Infiltration Practices

- ▣ Direct downspouts towards the yard & install a rain barrel
- ▣ Use permeable pavers/pavements
- ▣ Improve shorelines with buffer strips
- ▣ Plant drought tolerant species (Xeriscaping)
- ▣ Install a rain garden

Rain Barrels

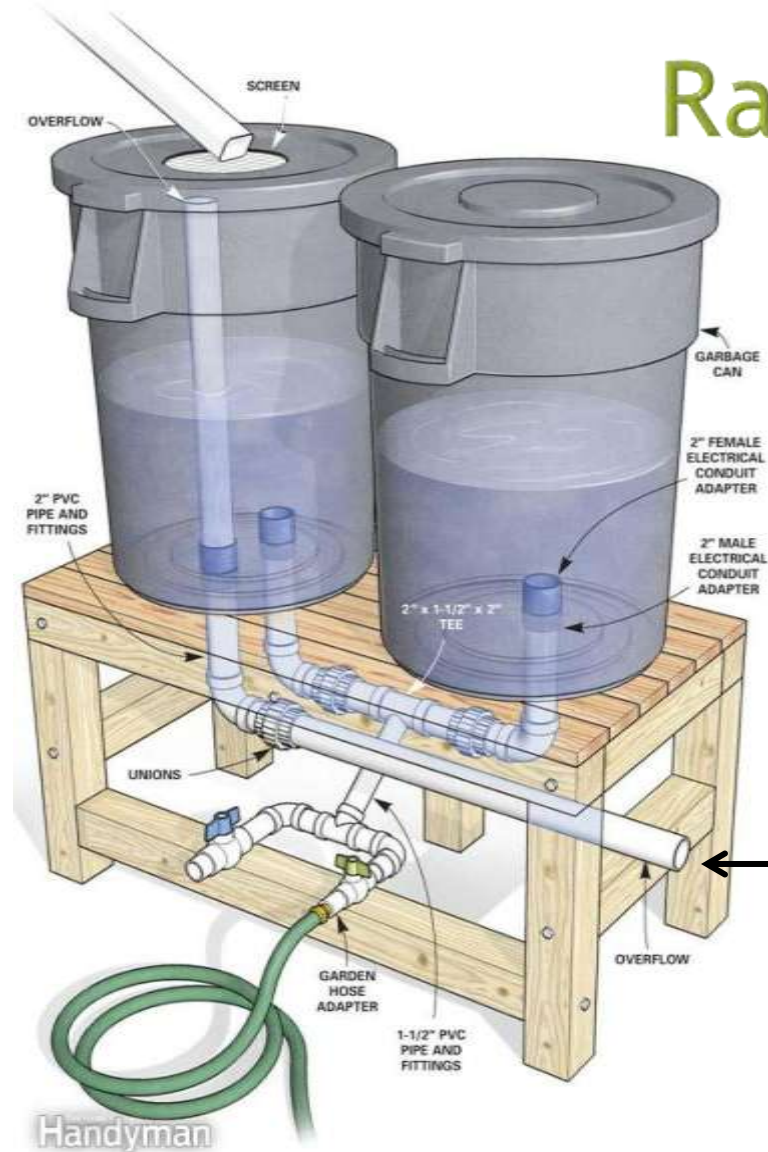
Cheap and Effective
Useful Irrigation Tool
Decorative and Creative Opportunities



MASTER WATER STEWARD

Community Leadership for Clean Water

Rain Barrel



Overflow pipe must be appropriately sized: 2" min.

Must be elevated to create hydraulic Head pressure:
Gravity feed system

Rainwater Harvesting



Rain barrel is too low to the ground & the overflow too small.



Rain barrel is placed high & overflow is properly sized.

Recycled Wine Barrels with a Rain Chain

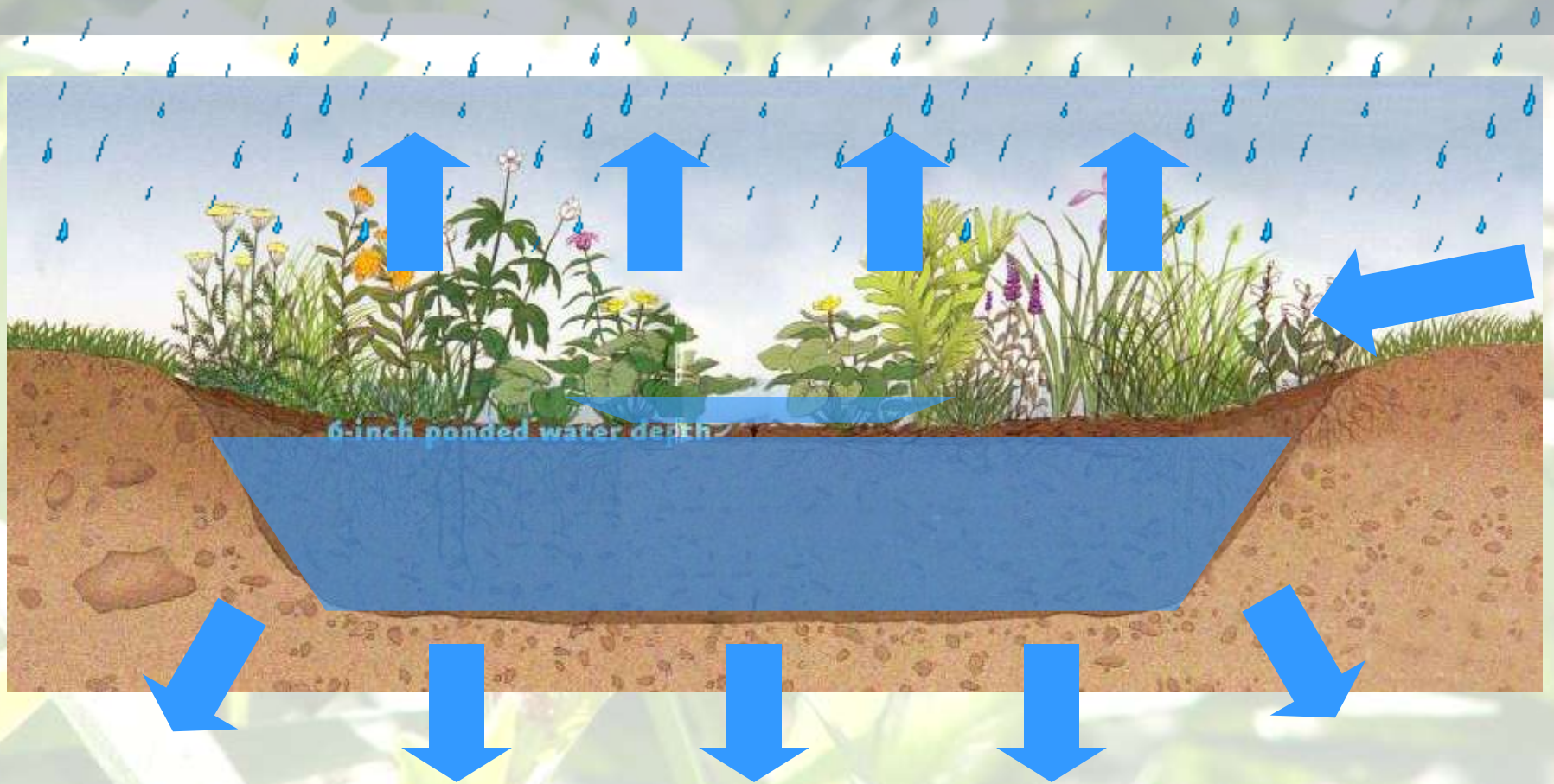


Important Steps for Installation?

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)



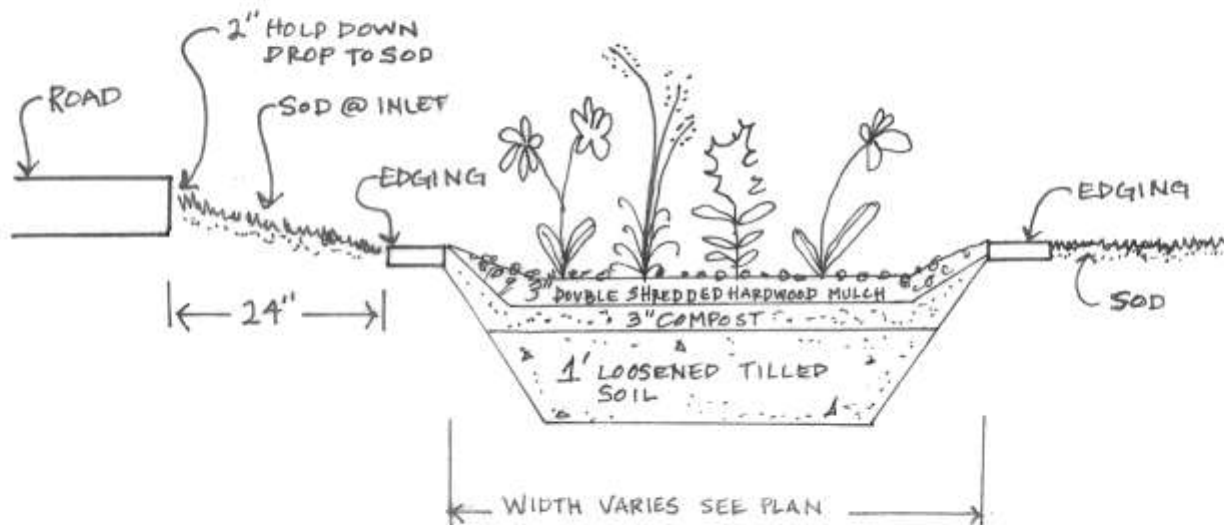
Raingardens: How they work



Just like a regular garden planting, but able to store and absorb rainwater while breaking down pollutants and providing habitat

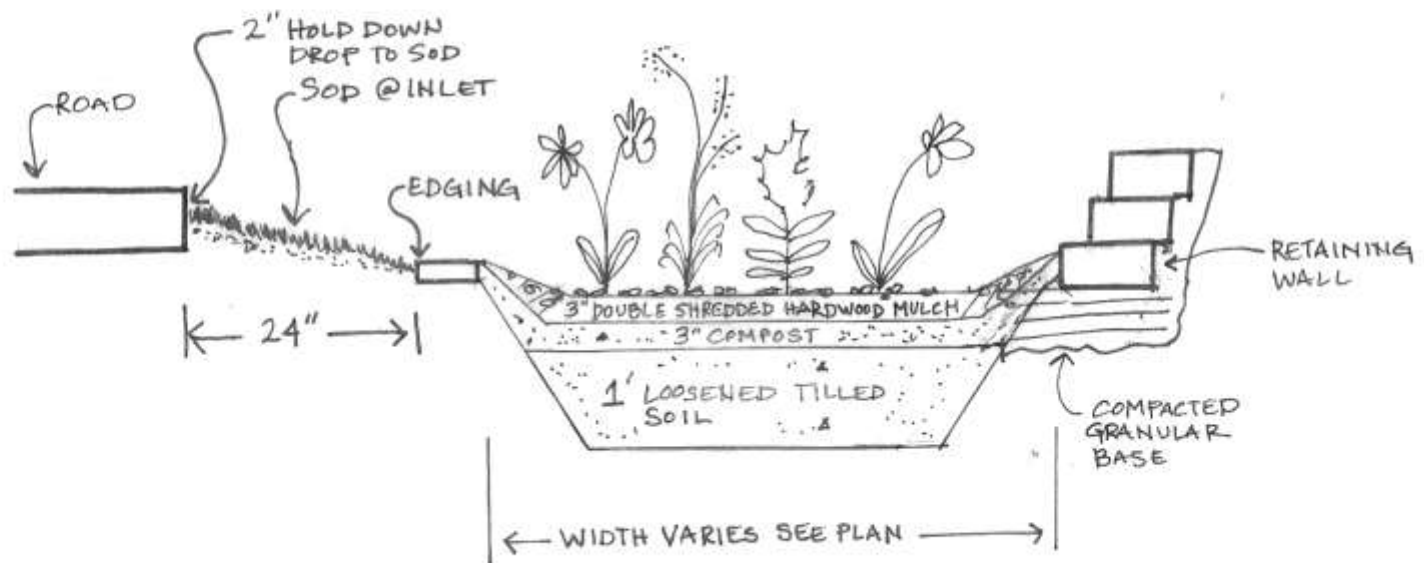
CROSS-SECTION

- NOT TO SCALE



CROSS-SECTION

- NOT TO SCALE



Mosquitoes?



- Raingardens are not wetlands. Properly designed raingardens are mosquito traps
- Designed to dry out in 24 hours
- Mosquitoes lay eggs in the water, then they dry out and die



Percolation Test



Select rain garden depth that drains in 24 hours

1 hr return measurement (in.) X 24 hrs = Rain garden depth

Example: $\frac{1}{4}$ " X 24 hrs = 6" deep



Clay – Squeezed into a ribbon



Sand – Does not compress



Loam – Texture between clay and sand

Basic Keys to Success

Hydrology



Soil Prep



Plant Selection



Topography and Hydrology

- What are the water sources?
Downspouts, Roadways, Driveway, Neighboring Property
- Where are the High and Low Points?
- Identify the paths of concentration.
- Where are the proper interception points?
Not at the bottom of the watershed
- Where is the water going? *Street, Neighboring Property, Water Body, Basement*
- What is in the water?
Road Salts and Sediments, Lawn chemicals



Typical
Residential
Property

+ “Green Concrete” Compacted Lawn
8,390 s.f. “impervious” x 1” rain
(if infiltrates first ¼” of rain)
= 3,880 gallons of runoff

1,500 s.f. house (& patio) x 1” rain
= 925 gallons of runoff

1,000 s.f. driveway x 1” rain
= 617 gallons of runoff

In a 1” rainfall
Potential
Runoff:
**5,422
gallons**

Average
American
household
uses

**127,400
gallons/yr**

American Waterworks
Association

with 30” yearly
precipitation

Potential
Runoff:

**171,532
gallons/yr**

Stormdrain

Street

Gregg Thompson, MASWCD

Practice Calculations



Design Considerations

- Identify existing vegetation - Work with your existing palette
- Determine location of utilities
- Locate all structures
- Determine property lines and easements
- Identify any local ordinances affecting project



Photo: Bonestroo

Locating the Garden

- Near downspouts, driveways, sump pump outlets (where is the water flowing?)
- Minimum 10', 20' ft. from foundation best (where is the slope from foundation?)
- Avoid utility lines & septic tanks

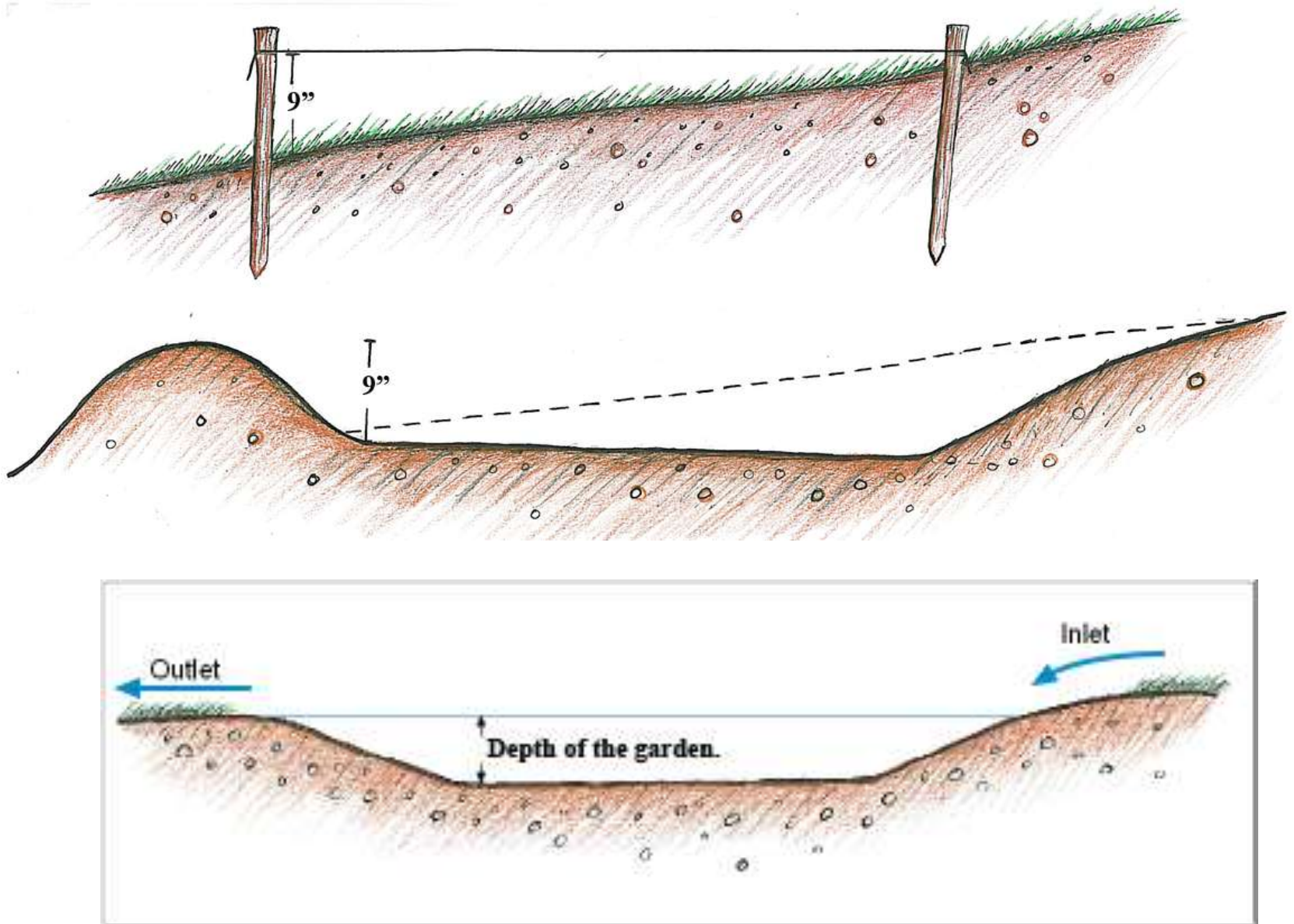


Sizing the Garden

- For residential yards, 6"-9" depth is sufficient
- An average size might be about 8' x 10' near one downspout (75-100 sq.ft.)
- Fit into landscaping
- yours and neighbors



Depth of the Garden



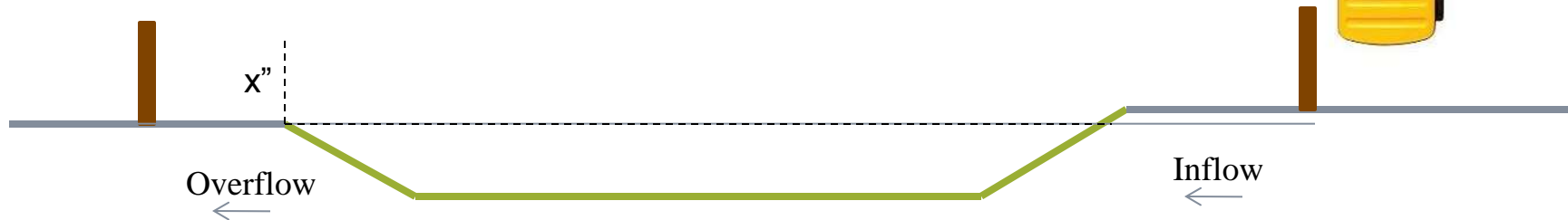
Making the “Flat-Bottomed Bowl”

Start measuring with “known” points

Ensure correct elevations at inflow and overflow points

Spot check elevations of garden bottom

Elevation is critical! Failure is not an option



Garden Soil Prep

- Double-dig
- Over-dig soils
- Amend with compost
- Depth of garden is not more than 12" deep



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Garden Soil Prep

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Materials

Time to build a garden



Double Shredded
Hardwood Mulch



Compost



Plants





Over-Dig



Basin Construction
Level Survey



Basin Construction
Level Survey



Mulch First



Planting

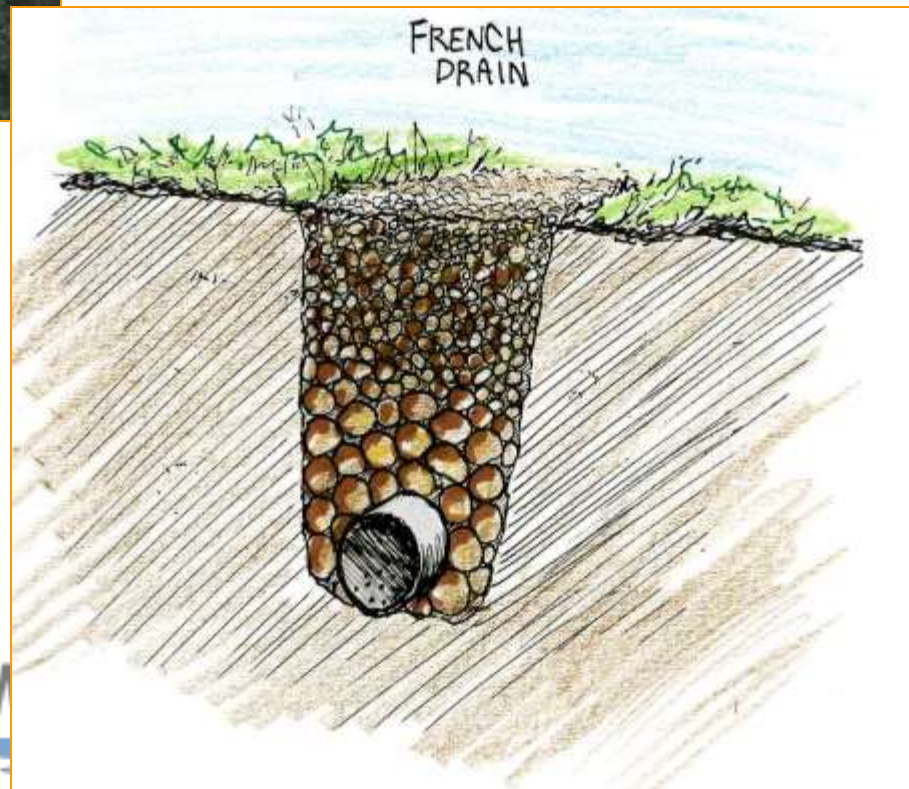


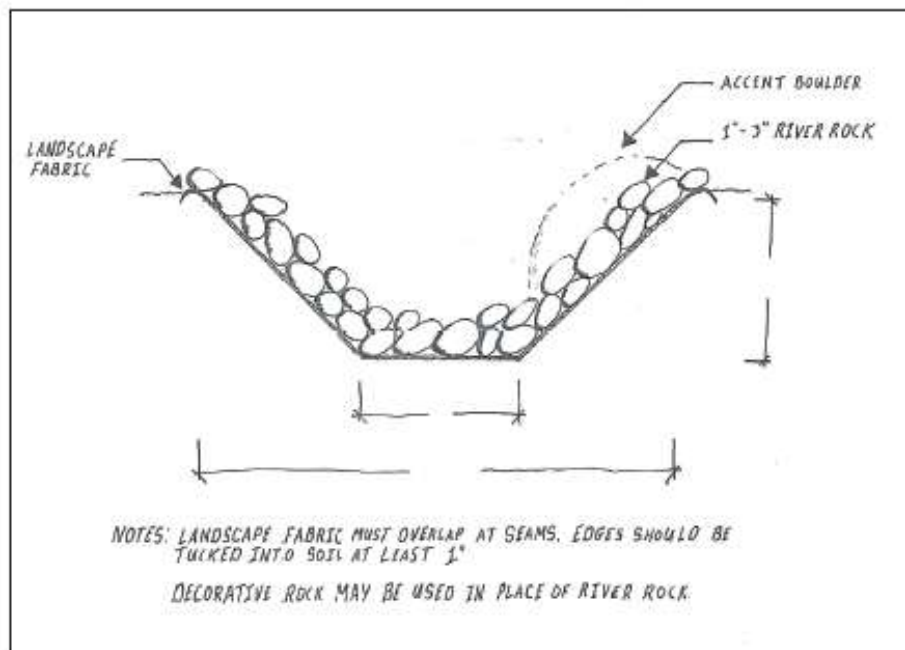
Watering and
Smiling

Pipe/Stream Systems



Pipe/Stream Systems





TOP LEFT: DRY CREEK DOWN A HILL



TOP RIGHT: DRY CREEK CATCHES ROOF RUNOFF AND DIRECTS WATER TO A RAINGARDEN

BOTTOM LEFT: WATER COLLECTED ON THE DRIVEWAY

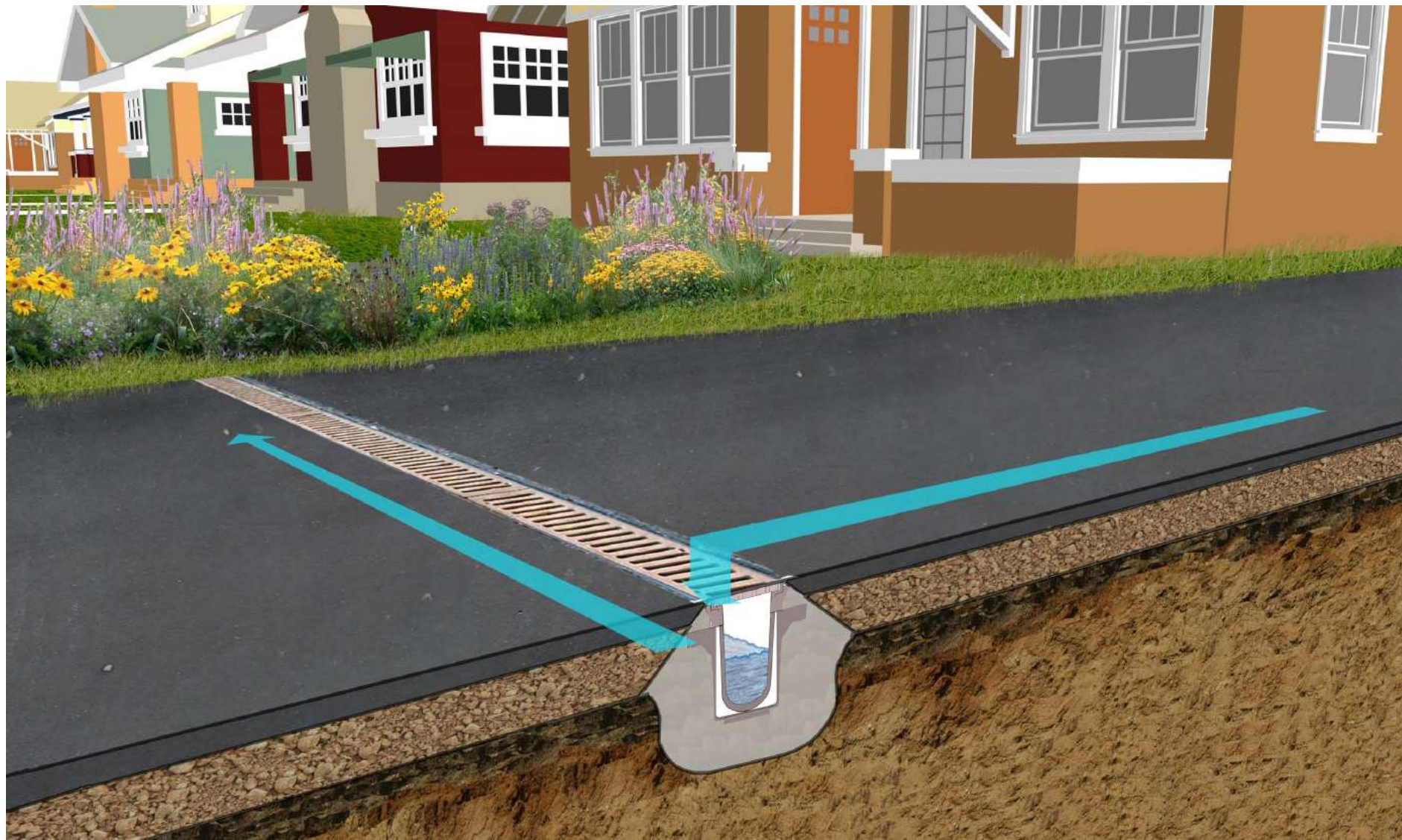
BOTTOM RIGHT: DRY CREEK ALLOWED WATER TO EXIT DRIVEWAY AND ENTER A RAINGARDEN

EXAMPLE DRY CREEK DETAIL
NOT TO SCALE





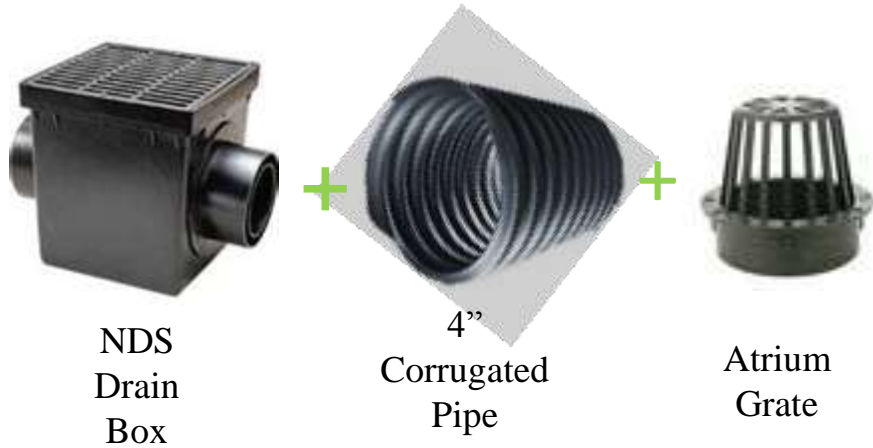




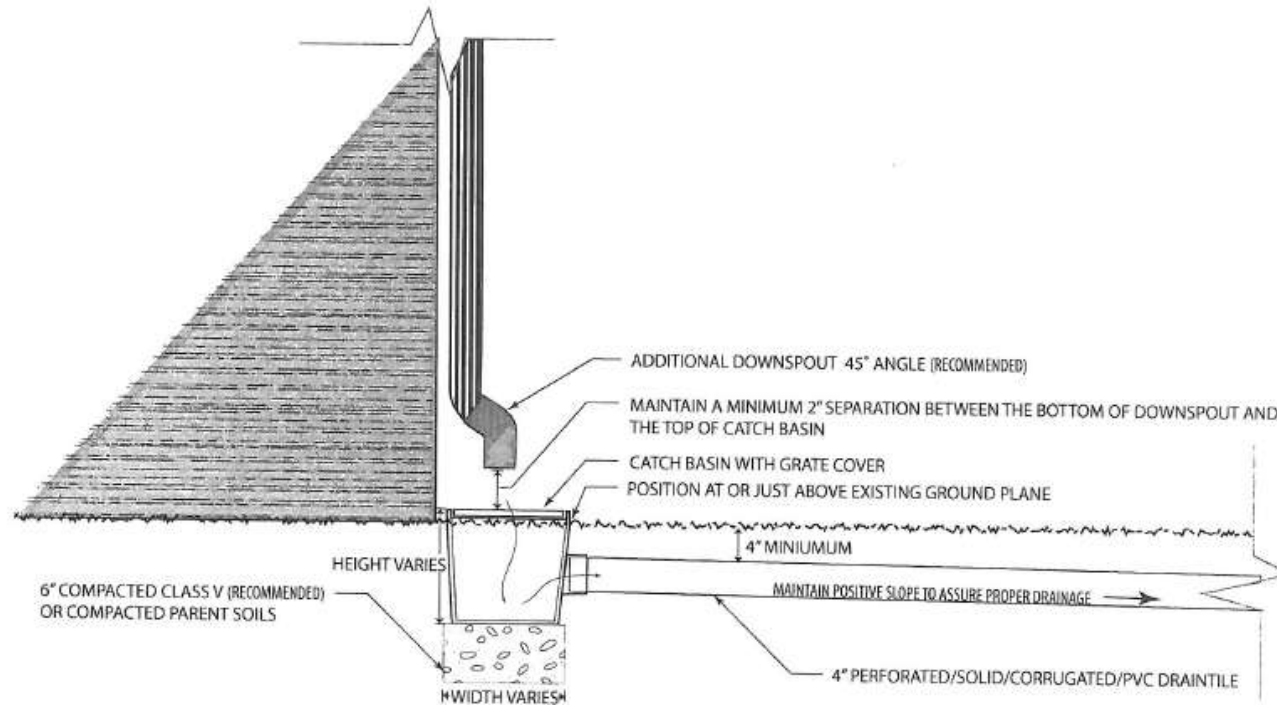
Trench/Channel Drain

Conveyance Systems

Drain Box and Pipe



EXAMPLE DOWNSPOUT CATCHBASIN/UNDERGROUND TILE DETAIL



NOTES: CATCH BASIN STYLES VARY, IF AN ADDITIONAL DOWNSPOUT ANGLE IS NOT USED, POSITION CATCH BASIN AT OR SLIGHTLY OUT FROM THE DOWNSPOUT ANGLE SO RAINWATER HITS THE CATCH BASIN'S CENTER FOR MAXIMUM CAPTURE.
Installation instructions (before or after draitile trench is excavated):

1. Excavate area for catch basin to be set in.
2. (Recommended) Overexcavate bottom and add 6" of compacted class V OR compact parent soils.
3. Set basin so it is level with its top at or just about existing ground plane.
4. Attach draitile and backfill.



Raingarden w/ Downspout Connection



Anoka Conservation
District

Example Design and Installation



Anoka Conservation
District

Example Design and Installation

Community Leadership for Clean Water



Anoka Conservation
District

Example Design and Installation

Community Leadership for Clean Water

Anoka Conservation
District



Example Design and Installation

Community Leadership for Clean Water

Plant Selection

The Blue Thumb Guide to

Raingardens

Design and Installation for
Homeowners in the Upper Midwest

BY RUSTY SCHMIDT, DAN SHAW, AND DAVID DODS

A Guide for Planting Zones 3, 4 and 5

Blue
Thumb
PLANTING FOR CLEAN WATER™

Plant lists

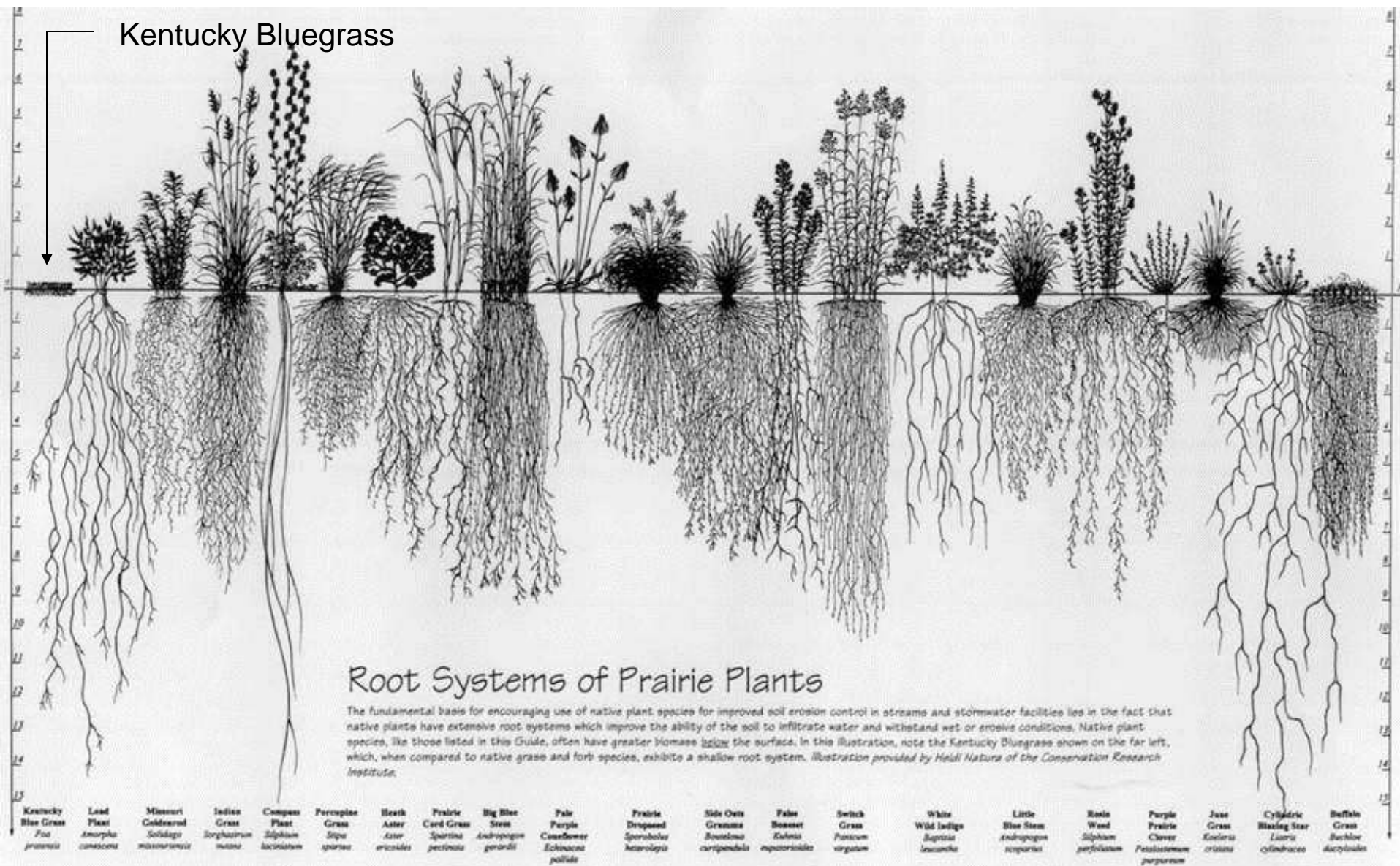


Why Natives?



... provide habitat for wildlife
...well adapted to Minnesota environment

Roots of Native Prairie Plants



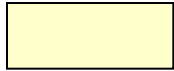
Pre-settlement Native Plant Communities



Big Woods



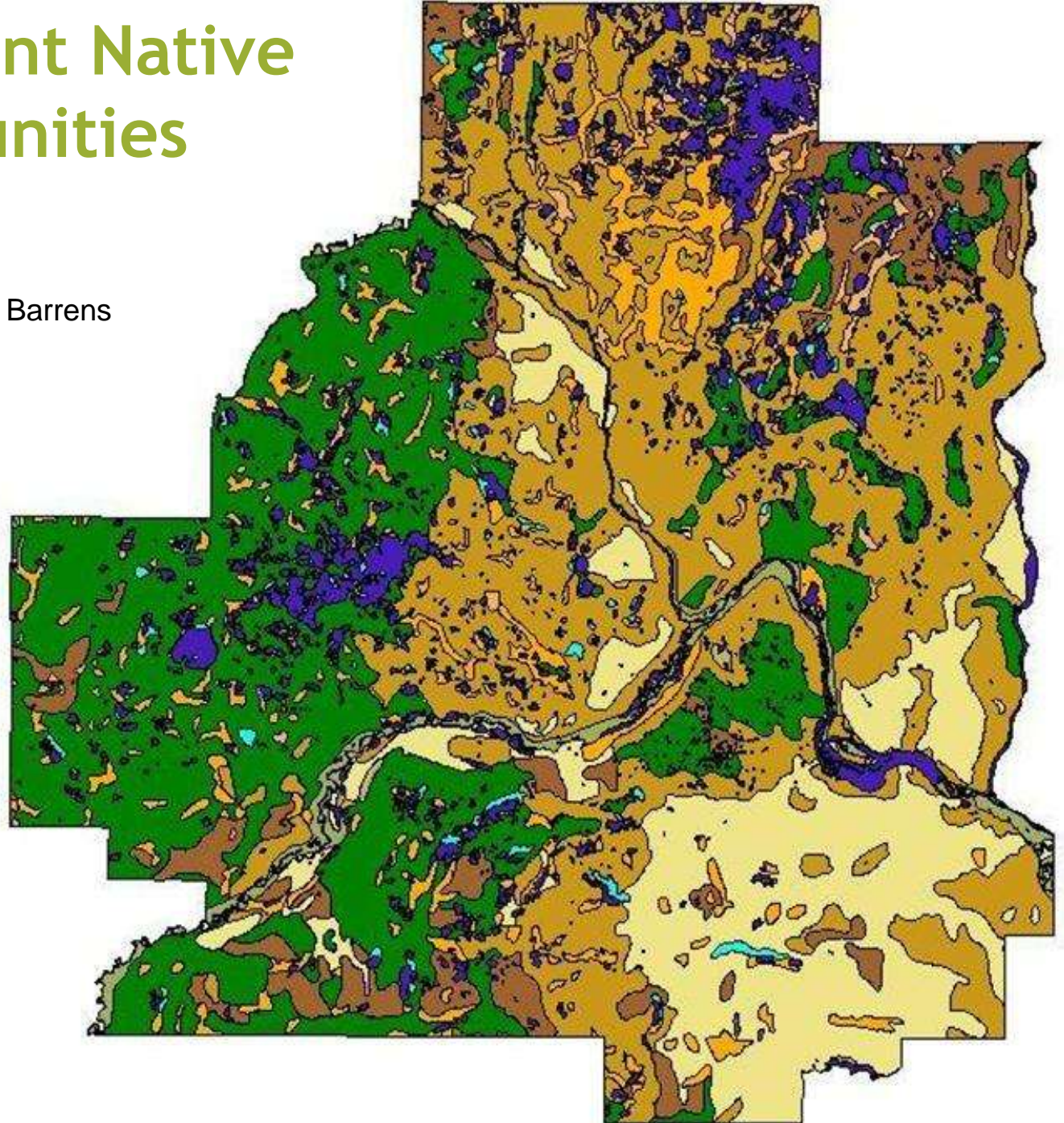
Oak Openings & Barrens



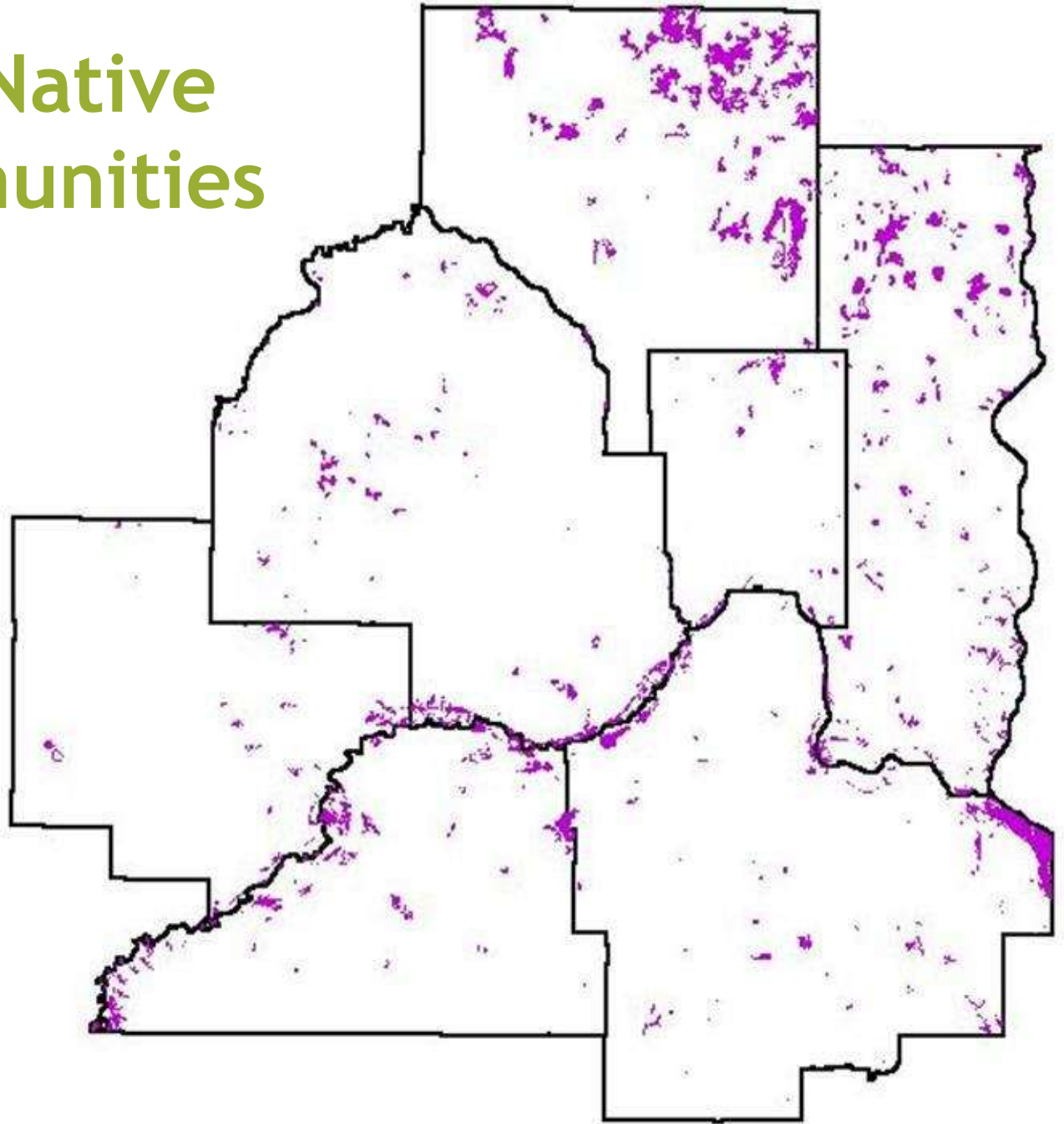
Prairie



Wet Meadow



Remaining Native Plant Communities



Plant Selection Criteria

Moisture variance

Sun/Shade

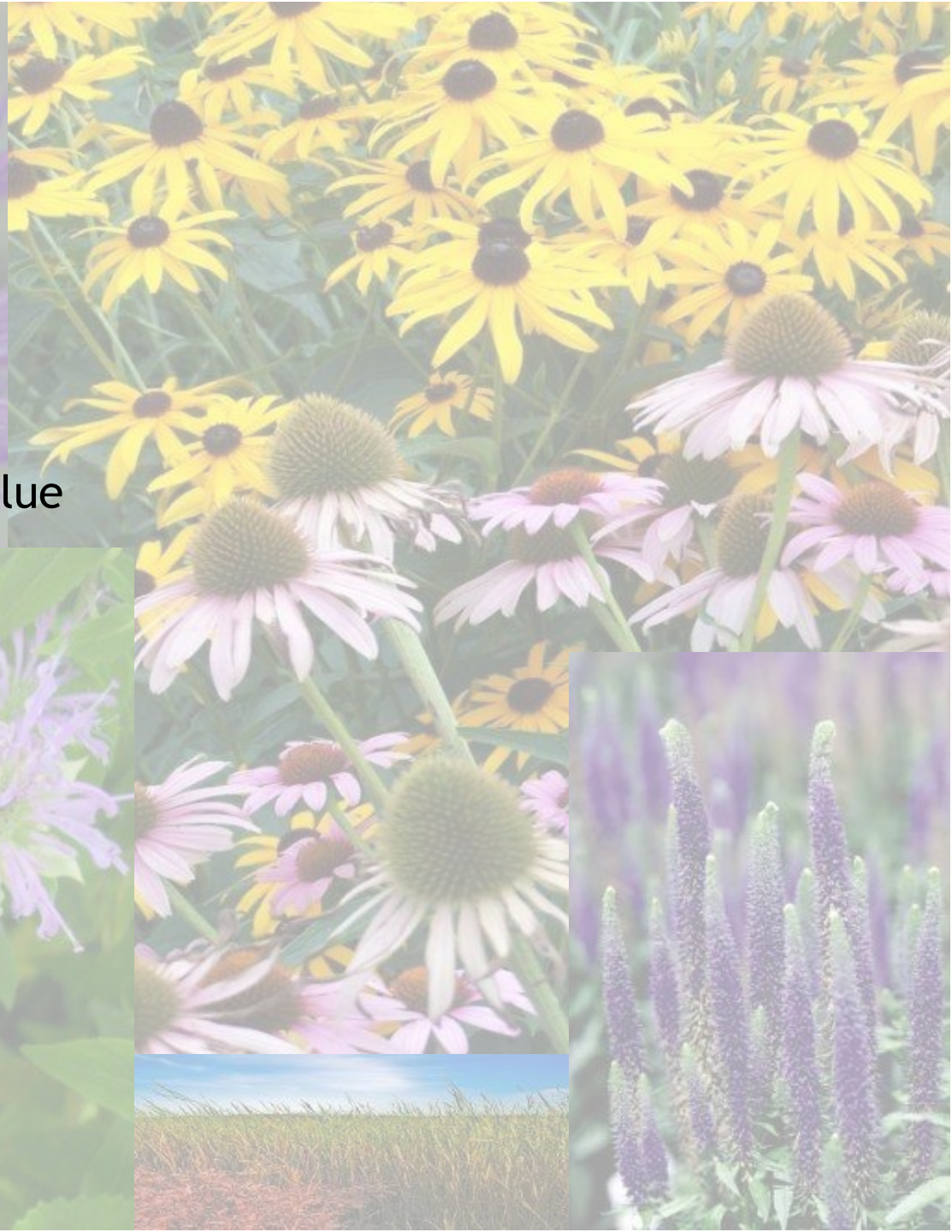
Soil drainage, pH, nutrient value

Bloom Time and Color

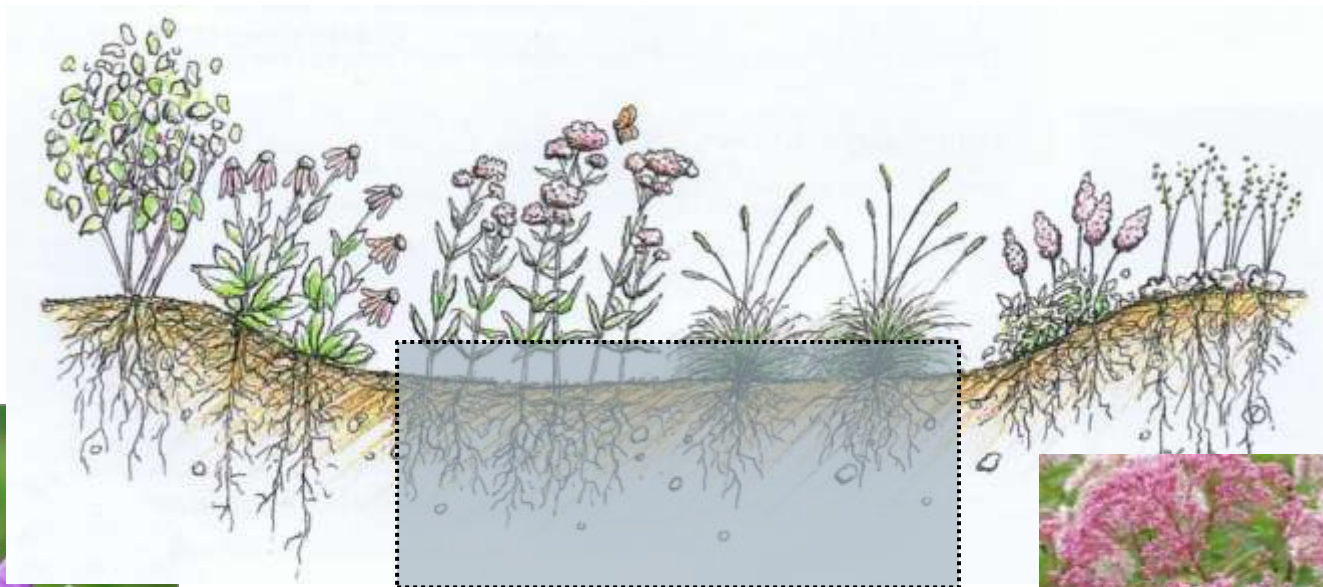
Height and Width

Wildlife Value

Purchase Availability



Soil Moisture Tolerances



Moist Soil Conditions

- Located at the bottom of the raingarden basin

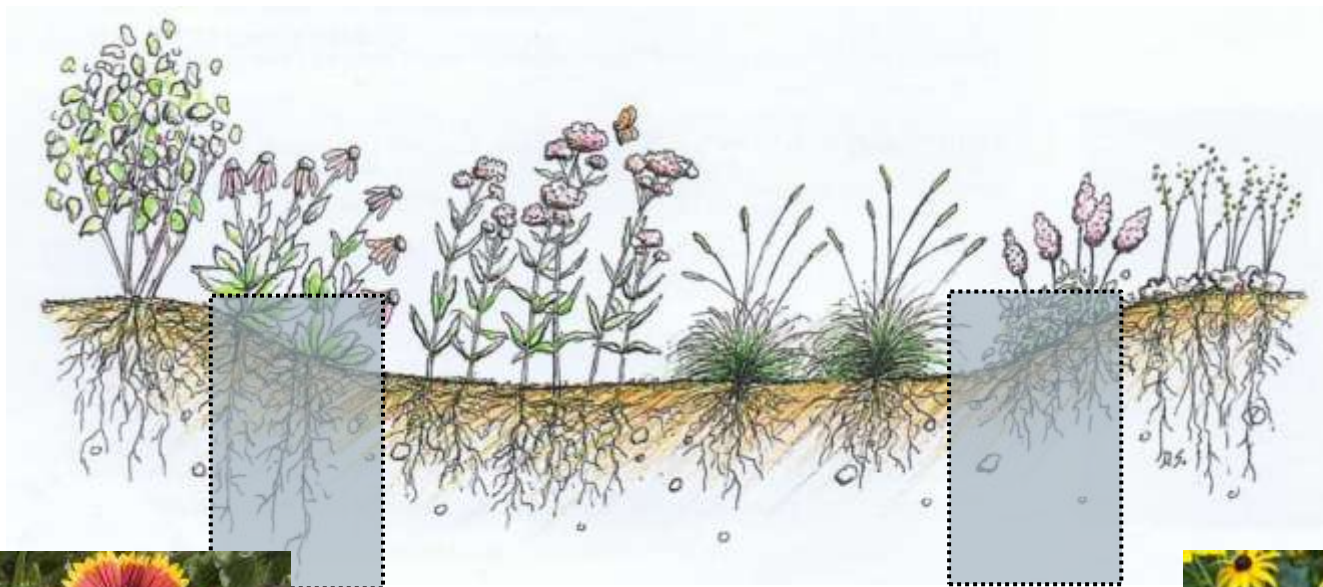


(*Iris versicolor*)
Blue Flag Iris



Joe Pye Weed
(*Eupatorium
maculatum*)

Soil Moisture Tolerances



Average to Moist Soil Conditions

- Located on the sides of the raingarden



(*Gaillardia x grandiflora*)

Indian Blanket



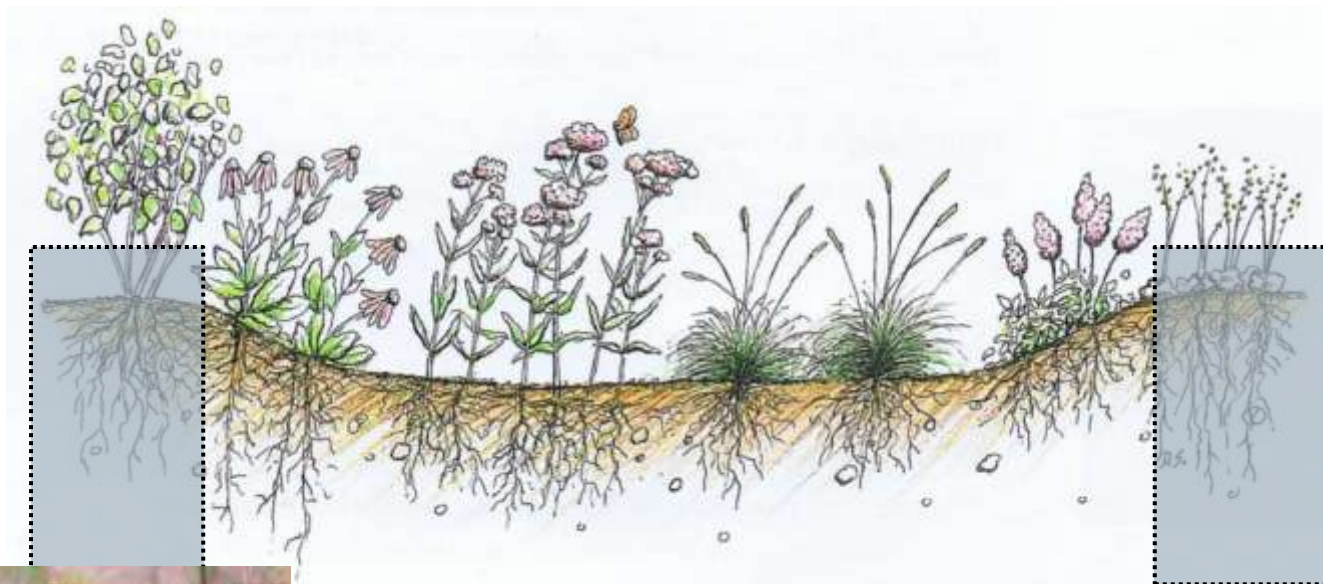
(*Rudbeckia hirta*)

Black Eyed-Susan

(*Echinacea purpurea*)

Purple Coneflower

Soil Moisture Tolerances



Average to Dry Soil Conditions

- Located at the top of the rain garden



Prairie Smoke
(*Geum triflorum*)



Penn Sedge
(*Carex pennsylvanica*)



Purple Coneflower
Echinacea purpurea

Hoary Vervain
Verbena stricta

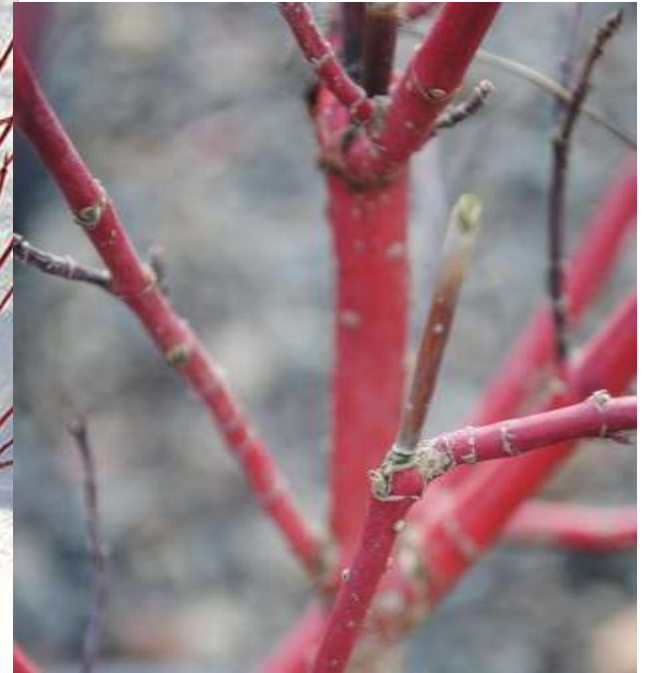
Butterfly Weed
Asclepias tuberosum

Grey Headed Coneflower
Ratibida pinnata

Dogwood
Cornus sericea

Woody Plants

Shrubs



Trees and Shrubs



Autumn Blaze Maple
Acer x freemanii
UMN Extension



Glossy Black Chokeberry
Aronia melanocarpa



River Birch
Betula nigra
Photo: David Dods

'Summer Wine' Ninebark
Physocarpus opulifolius 'Summer Wine'

Woody Plants

Shrubs



Black Chokeberry
Aronia melanocarpa



Woody Plants

Shrubs

Highbush Cranberry
Viburnum trilobum 'compactum'

Woody Plants

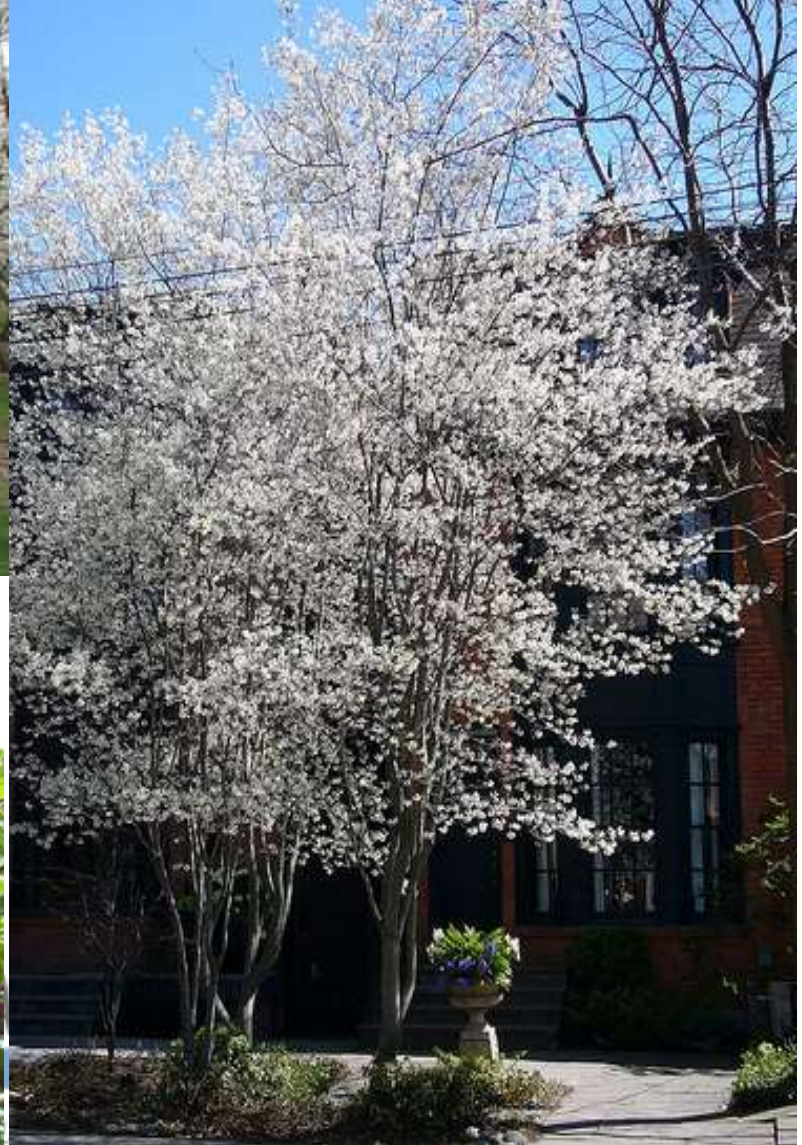
Shrubs



Serviceberry
Amelanchier spp.

Woody Plants

Shrubs



Dwarf Bush Honeysuckle
Diervilla lonicera

Woody Plants

Shrubs



Variety Considerations



Native:
New England Aster
Aster novae-angliae



Cultivated:
Purple Dome Aster
Aster novae-angliae 'Purple Dome'

Horticultural Varieties



Daylilies
Hemerocallis spp.
Photo: David Dods



Coral Bells
Heuchera spp
mygardenlife.com

Hostas
Hosta spp.



Shenandoah Switchgrass
Panicum virgatum 'Shenandoah'

Grasses
Tall + Wet



Karl Foerster Feather Reed Grass
Calamagrostis x acutiflora 'Karl Foerster'

Grasses

Tall + Wet



'Sioux Blue' Indian Grass
Sorghastrum nutans 'Sioux Blue'

Grasses
Tall + Wet



Little Bluestem
Schizachyrium scoparium

Grasses

Short + Dry



Side Oats Grama
Bouteloua curtipendula

Grasses

Short + Dry



Blue Grama
Bouteloua gracilis

Grasses

Short + Dry



June Grass
Koeleria macrantha

Grasses

Short + Dry



Prairie Dropseed
Sporobolus heterolepis

Grasses

Short + Dry



Blue Flag Iris
Iris versicolor



Sun Plants

Tall + Wet



Joe-Pye Weed
Eupatorium maculatum

Sun Plants

Tall + Wet



'Little Joe' Joe-Pye Weed
Eupatorium dubium 'Little Joe'

Jacob's Ladder
Polemonium reptans



Shade Plants

Short + Dry



Sun Plants

Tall + Dry

Wild Blue Indigo
Baptisia australis



'twilight prairieblues'

Black Eyed Susan
Rudbeckia fulgida 'Goldsturm'

Sun Plants

Tall + Dry



Blazing Star
Liatris spp.

Sun Plants

Tall + Dry



Liatris spicata 'kobold'



Liatris ligulistylis



Liatris pycnostachya



Liatris aspera



Aster spp.

Sun Plants

Tall + Dry



Silky Aster
Aster sericeus



New England Aster
Aster novae-angliae
Cultivar 'Purple Dome'

Salvia
Salvia nemorosa

Sun Plants

Short + Dry



Husker Red Penstemon
Penstemon digitalis 'Husker Red'



Sun Plants

Tall + Dry



Butterfly Milkweed
Asclepias tuberosa

Sun Plants

Short + Dry



Yarrow
Achillea millefolium

Sun Plants

Short + Dry



'Paprika'



'Moonshine'

Coreopsis
Coreopsis verticillata

Sun Plants

Short + Dry



'Moonbeam'



'Zagreb'

Purple Prairie Clover
Dalea purpurea

Sun Plants

Short + Dry



Prairie Smoke
Geum triflorum

Sun Plants

Short + Dry



Sedum
Sedum spectabilis

Sun Plants

Short + Dry



Spiderwort
Tradescantia ohiensis



Sun Plants

Short + Dry



Purple Coneflower
Echinacea purpurea

Sun Plants

Tall + Dry



Russian Sage
Perovskia atriplicifolia

Sun Plants

Tall + Dry



Rattlesnake Master
Eryngium yuccifolium

Sun Plants

Tall + Dry



Yellow Coneflower
Ratibida pinnata

Sun Plants

Tall + Dry



Wild Ginger
Asarum canadensis



Shade Plants

Short + Dry



Bee Balm
Monarda spp.

Sun Plants

Tall + Wet



Wild Bee Balm
Monarada fistulosa



Bee Balm
Monarada didyma 'Jacob Cline'

Wild Geranium
Geranium maculatum

Shade Plants

Short + Dry



Coral Bells
Heuchera spp.



Native Coral Bells
Heuchera richardsonii

Shade Plants

Short + Dry



Coral Bells
Heuchera 'Palace Purple'

Sedges
Carex spp.

Shade Plants

Short + Wet



Soft Rush
Juncus effusus

Shade Plants

Tall + Wet



Sensitive Fern
Onocleus sensibilis

Shade Plants

Short + Wet



Blue Lobelia
Lobelia siphilitica

Shade Plants

Tall + Wet



Turtlehead
Chelone glabra



Shade Plants

Tall + Wet



Hosta
Hosta spp.

Shade Plants

Short + Wet



Astilbe
Astilbe japonica, *Astilbe chinensis*

Shade Plants

Short + Dry



Solomon's Seal
Polygonatum biflorum

Shade Plants

Tall + Dry



Bleeding Heart
Dicentra spectabilis

Shade Plants

Tall + Dry



Maidenhair Fern
Adiantum pedatum

Shade Plants

Short + Wet



Wild Columbine
Aquilegia canadensis

Shade Plants

Short + Dry



Lady Fern
Athyrium felix-femina

Shade Plants

Tall + Wet



Japanese Painted Fern
Athyrium niponicum

Shade Plants

Tall + Wet



Design Objectives

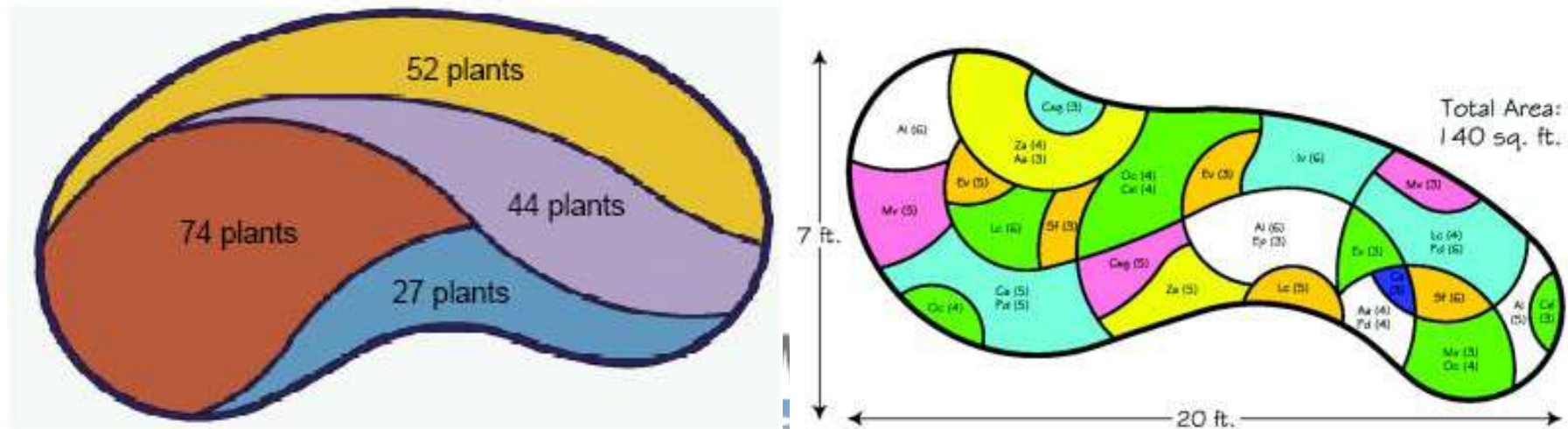
Mixture of Grasses, Forbs, and Shrubs

Mixture of natives and cultivars of natives

Plant massing, drifts



Figure 1 consists of two diagrams of a 20 ft by 7 ft plot. The left diagram shows five overlapping circles representing different plant species with counts: 47 plants (red), 25 plants (yellow), 25 plants (green), 25 plants (purple), and 27 plants (blue). The right diagram shows the same plot divided into 20 numbered regions, each containing a specific plant species and count. The total area is 140 sq. ft.



Plant layout and design: Piet Oudolf





Hard edges
are your friend

Photo: Shawn Tracy

Project Profiles

The background of the slide is a photograph of tall, thin blades of grass, possibly reeds or papyrus, reaching upwards. The grass is dark green and silhouetted against a bright, overcast sky with soft, white clouds. The overall mood is serene and natural.

Burnsville, MN

A Municipal Success Story



Barr Engineering Study

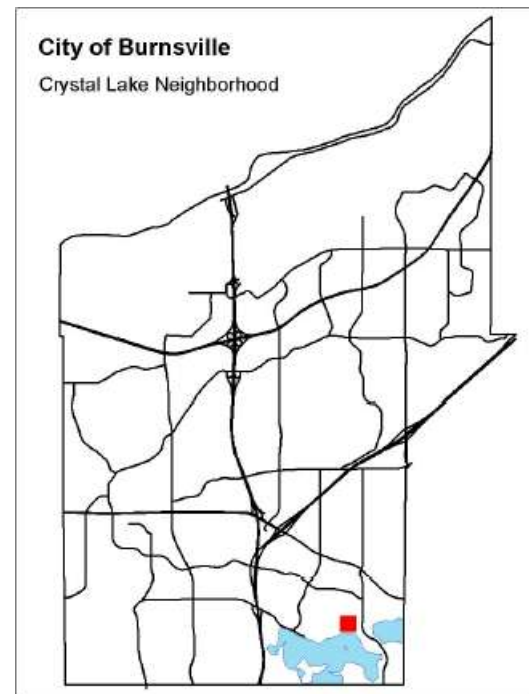
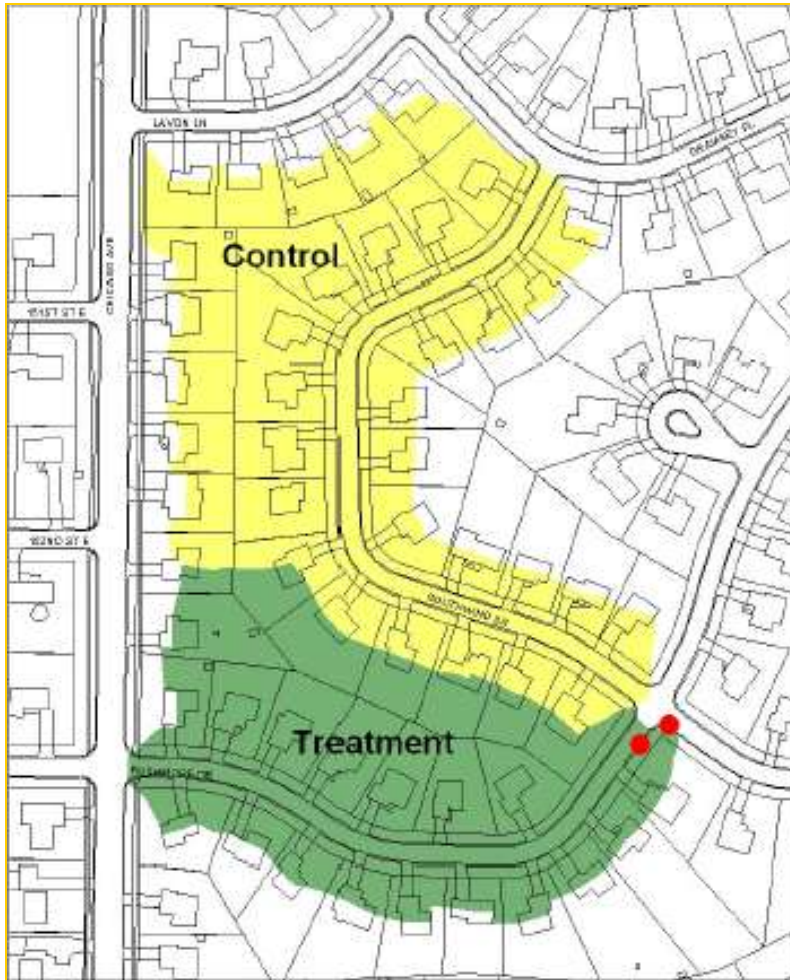
Photo: Rusty Schmidt, URS





Burnsville, MN

Paired Study of Residential Street Runoff Control



Burnsville Stormwater Retrofit Study

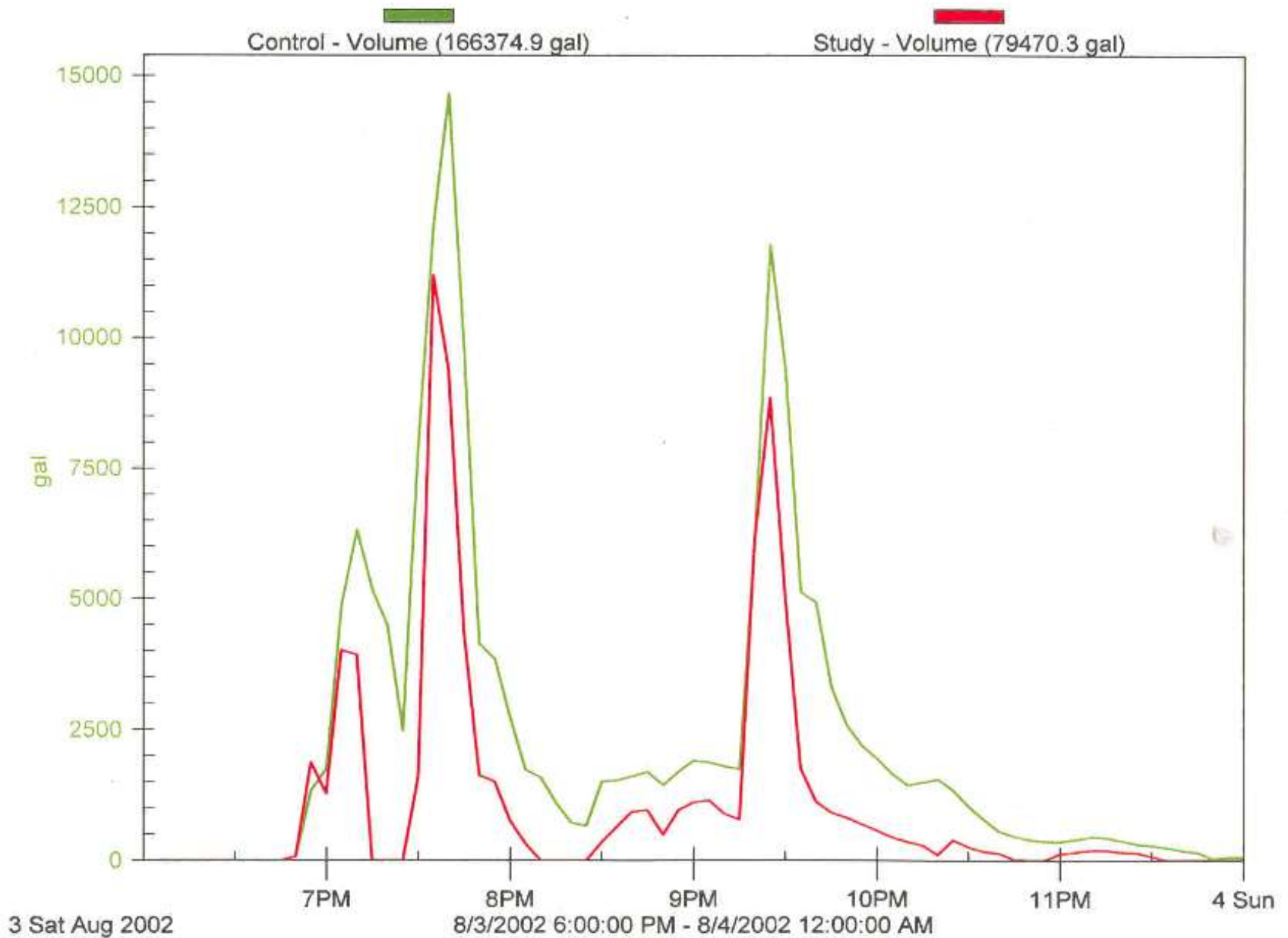
Burnsville, MN



Diagram courtesy of the City of Burnsville, MN from their Burnsville Stormwater Retrofit Study

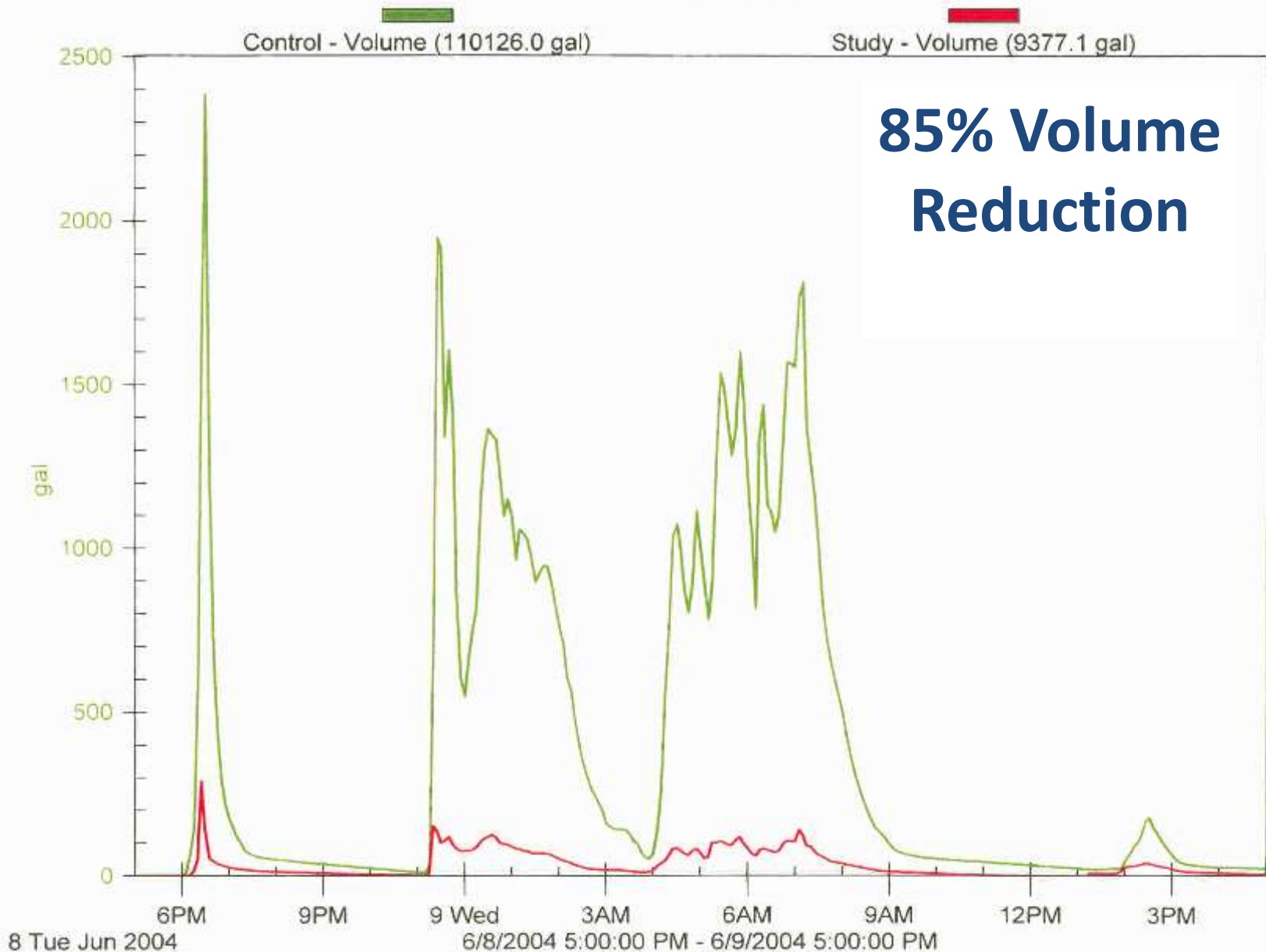
Pre-Construction Runoff Volumes

August 3, 2002 - 2.67" Rainfall



Post-Construction Runoff Volumes

June 8, 2004 - 1.46" Rainfall





Before



City of Burnsville

Designed by: Barr Engineering



After



City of Burnsville

Designed by: Barr Engineering

City of Burnsville
Designed by: Barr Engineering



Karl Forester grass

Spirea

Rose 'Nearly wild'

Day Lilies

Purple dome aster

Autumn Joy Sedum

8. 2. 2004



Day Lilies

Rose 'Nearly wild'

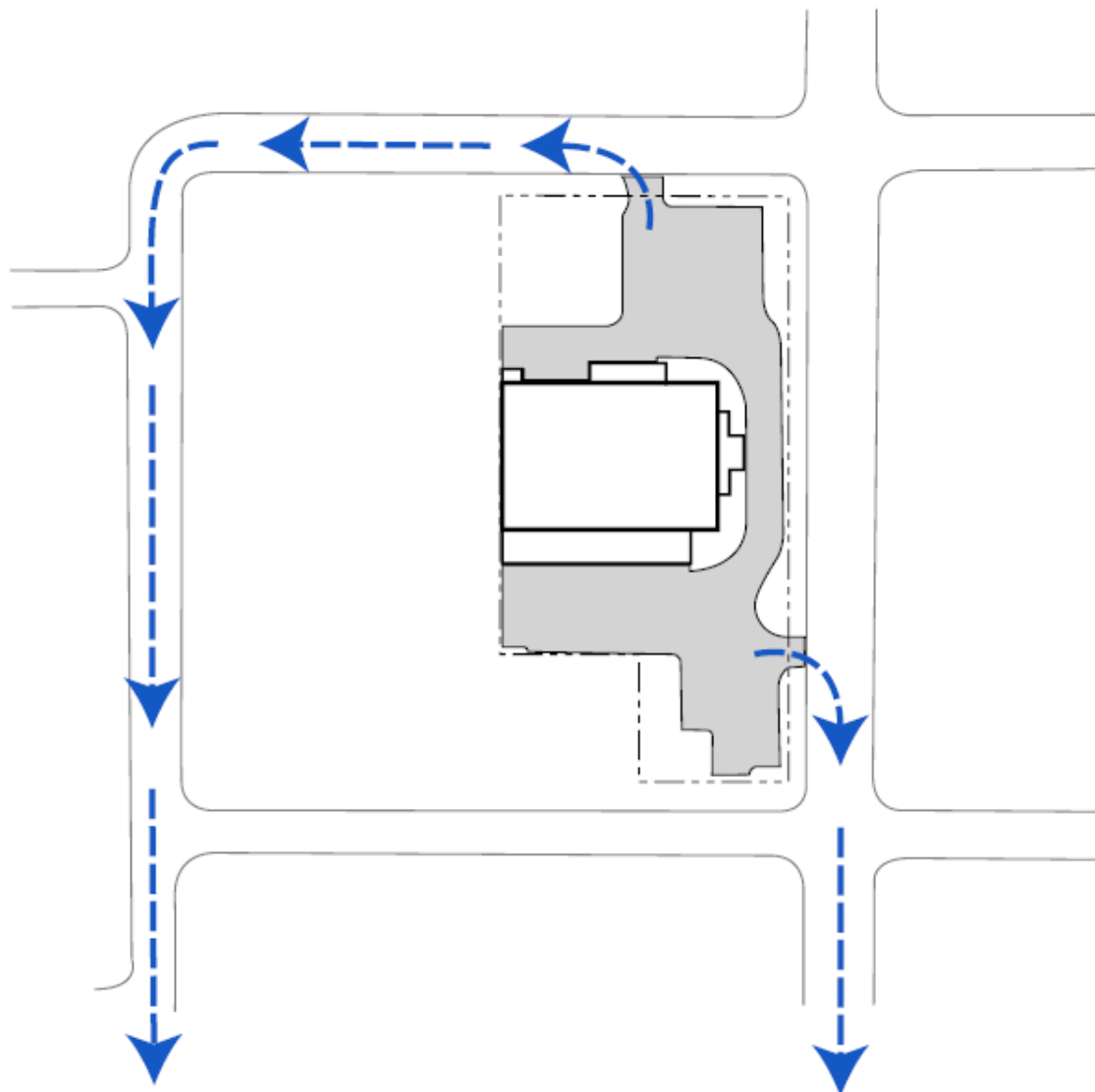
Karl Foerster grass

Spirea

Purple dome aster

Autumn Joy Sedum

10.4.2004



MASTER WATER STEWARD
Community Leadership for Clean Water





Stormwater Pipe Flow

The diagram shows a city grid with a river on the left. A dashed blue line with arrows indicates the path of stormwater flow from a building (orange rectangle) through the grid to the river. A solid blue line also flows into the river. A horizontal line crosses the river and the grid.

MASTER WATER STEWARD

Community Leadership for Clean Water





Dead Zone Hypoxic Water



MASTER WATER  STEWARD

Mississippi River Drainage Basin 
Community Leadership for Clean Water



Notes

Total Impervious area: 23,226 sq. ft.

Proposed Total Infiltration area: 2,650 sq. ft.

Gardens numbered 1-4, starting in the NW corner moving clockwise

Southwesternmost downspout on building discharges the majority of the roof water

NE Garden has existing curb cut

Rain Barrel location next to front entrance- outreach opportunity

Each curb cut will need a limestone rip section to diffuse water energy

All gardens will be between 6" and 9" depth

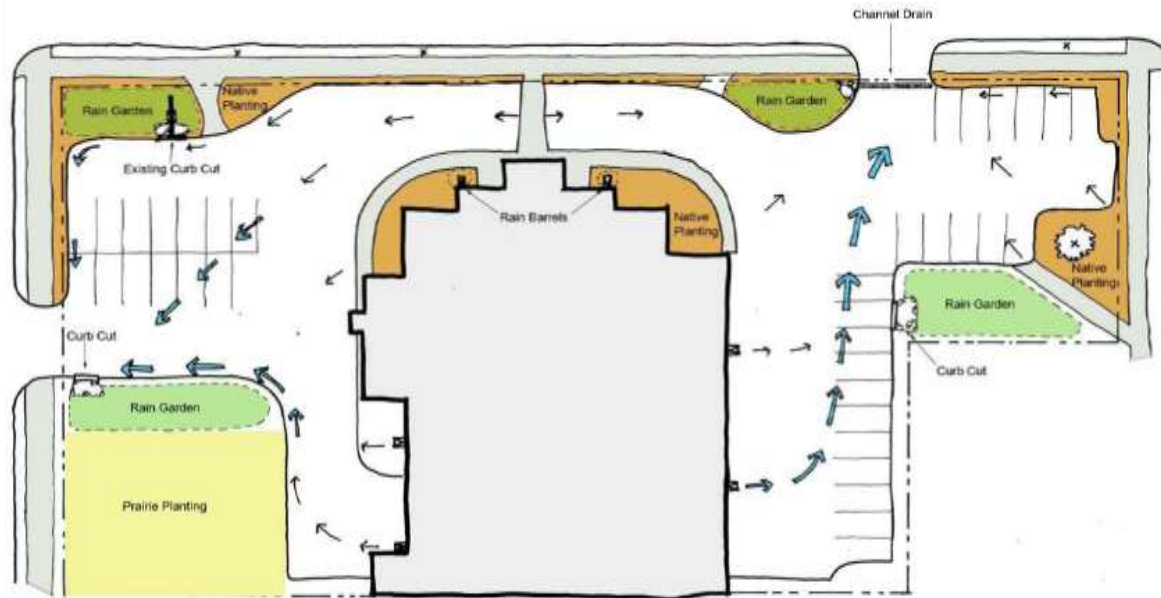
Soil is sandy and relatively coarse, yet heavily compacted

Garden #4 or SW garden, will require some regrading of the parking stall directly North. This will ensure all water truly does flow into the garden.

All plantings, including the prairie will need a ongoing maintenance plan.

Designer: Michael Keenan

Date: 9/14/09



Sentyrz Supermarket
Comprehensive Stormwater Plan
1612 2nd St. NE
Minneapolis, MN

North
1" = 20'-0"

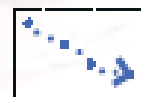




Birdseye View of Improved Sentyrz Supermarket, Facing Northwest



Path of Water Flow



Path of Water Flow

For more information on how you can capture rainwater on your property and help protect and



Metro Blooms



Excavation



Excavation



Public Events



Public Events



Public Events

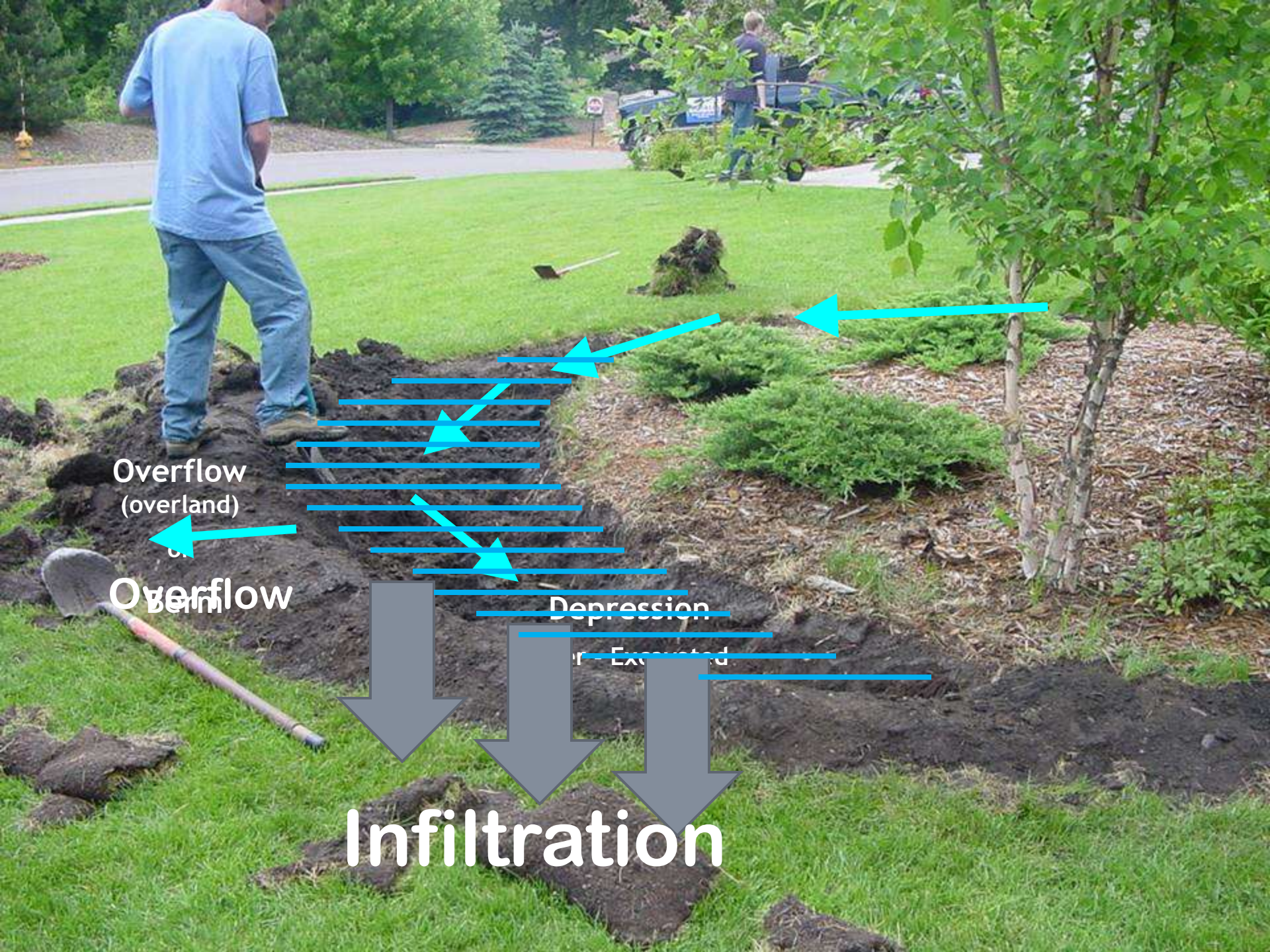








**300 gallons in
1" rainfall**



Overflow
(overland)

Overflow

Depression

or Excavated

Infiltration



Depression
(w/ compost)

Berm (w/ erosion-
control blanket)









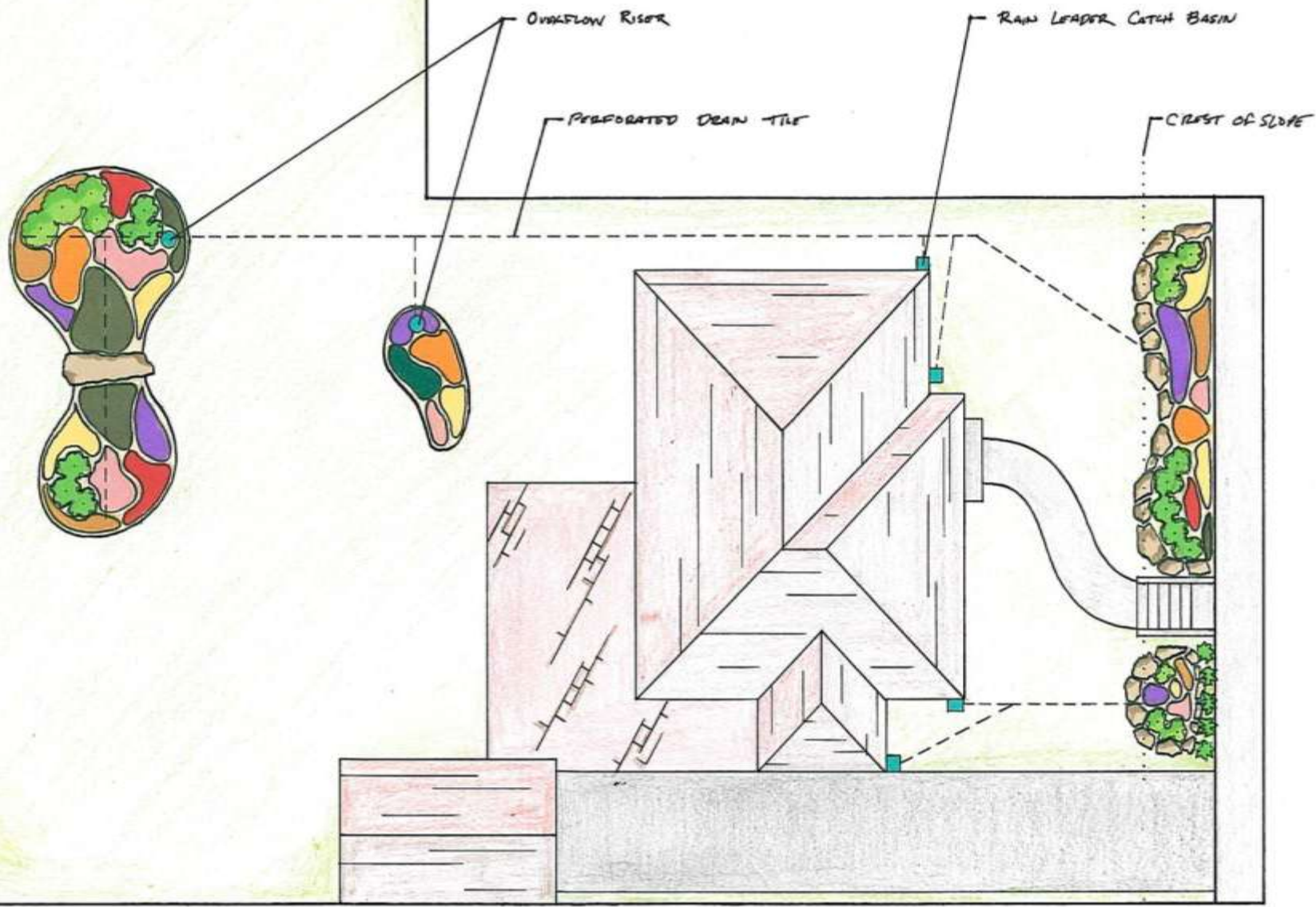


Berm

Rain Garden

Location







MASTER WATER  STEWARD
Community Leadership for Clean Water



Photo: Shawn Tracy; Earth Wizards, Inc.



Photo: Shawn Tracy



Year 1,
Installation Day

Photo: Shawn Tracy, Earth Wizards, Inc.



Year 2, June

Photo: Shawn Tracy, Earth Wizards, Inc.



Year 3, September

Photo: Shawn Tracy, Earth Wizards, Inc.

Apartment Buildings





- Existing Depression

-Place riser on existing
flush-mount drain

-**Mulch** (smother existing weak
lawn)

-**Plant**

Lake Harriet Community School (Minnehaha Creek Watershed)



6" Riser /
Adjustment Ring
(provided by
Mpls Public
Works)



Lake Harriet Community School – mulching/planting day



Lake Harriet Community School – planting day



1 year later

A close-up photograph of a frog in a pond. The frog has dark, mottled skin with lighter brown and yellowish patches. Its mouth is open, and a large, inflated, reddish-brown vocal sac is visible on the right side of its head. The frog is surrounded by green reeds and other aquatic plants. The water is dark and reflects some light. The text "Thank you!" is overlaid in white on the right side of the image.

Thank you!