

RAIN GARDEN TECHNICAL ASSISTANCE PROGRAM

RAIN GARDEN EDUCATION WORKSHOP
HAMILTON TOWNSHIP
MERCER COUNTY

May 2015

What happens to the rain in our watersheds?



It runs off of rooftops and pavement...

What is stormwater?

Stormwater is the water from rain or melting snows that can become “runoff,” flowing over the ground surface and returning to lakes and streams.



Pollutants Found in Stormwater

Sediment

Soil particles transported from their source

Biochemical Oxygen Demand (BOD)

- Oxygen depleting material
 - Ø Leaves
 - Ø Organic material

Toxics

- Pesticides
 - Ø Herbicides
 - Ø Fungicides
 - Ø Insecticides
- Metals (naturally occurring in soil, automotive emissions/ tires)
 - Ø Lead
 - Ø Zinc
 - Ø Mercury
- Petroleum Hydrocarbons (automotive exhaust and fuel/oil)

Nutrients

- Various types of materials that become dissolved and suspended in water (commonly found in fertilizer and plant material):
 - Ø Nitrogen (N)
 - Ø Phosphorus (P)

Bacteria/ Pathogens

Originating from:

- Pets
- Waterfowl
- Failing septic systems

Thermal Stress

Heated runoff, removal of streamside vegetation

Debris

Litter and illegal dumping



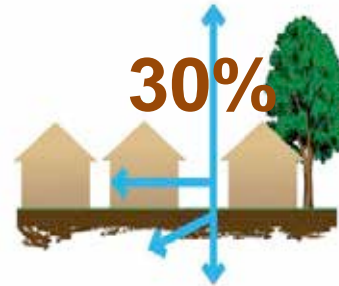
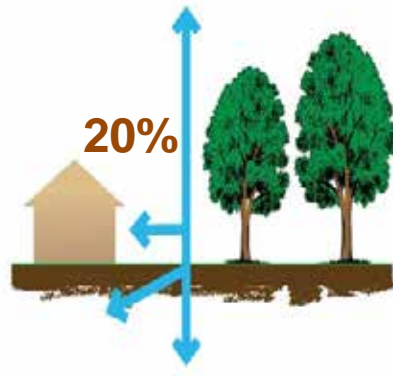
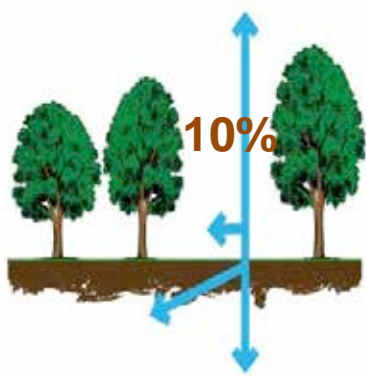
Impervious surfaces



Impervious surfaces



The Impact of Development on Stormwater Runoff



more development

→ *More impervious surfaces*

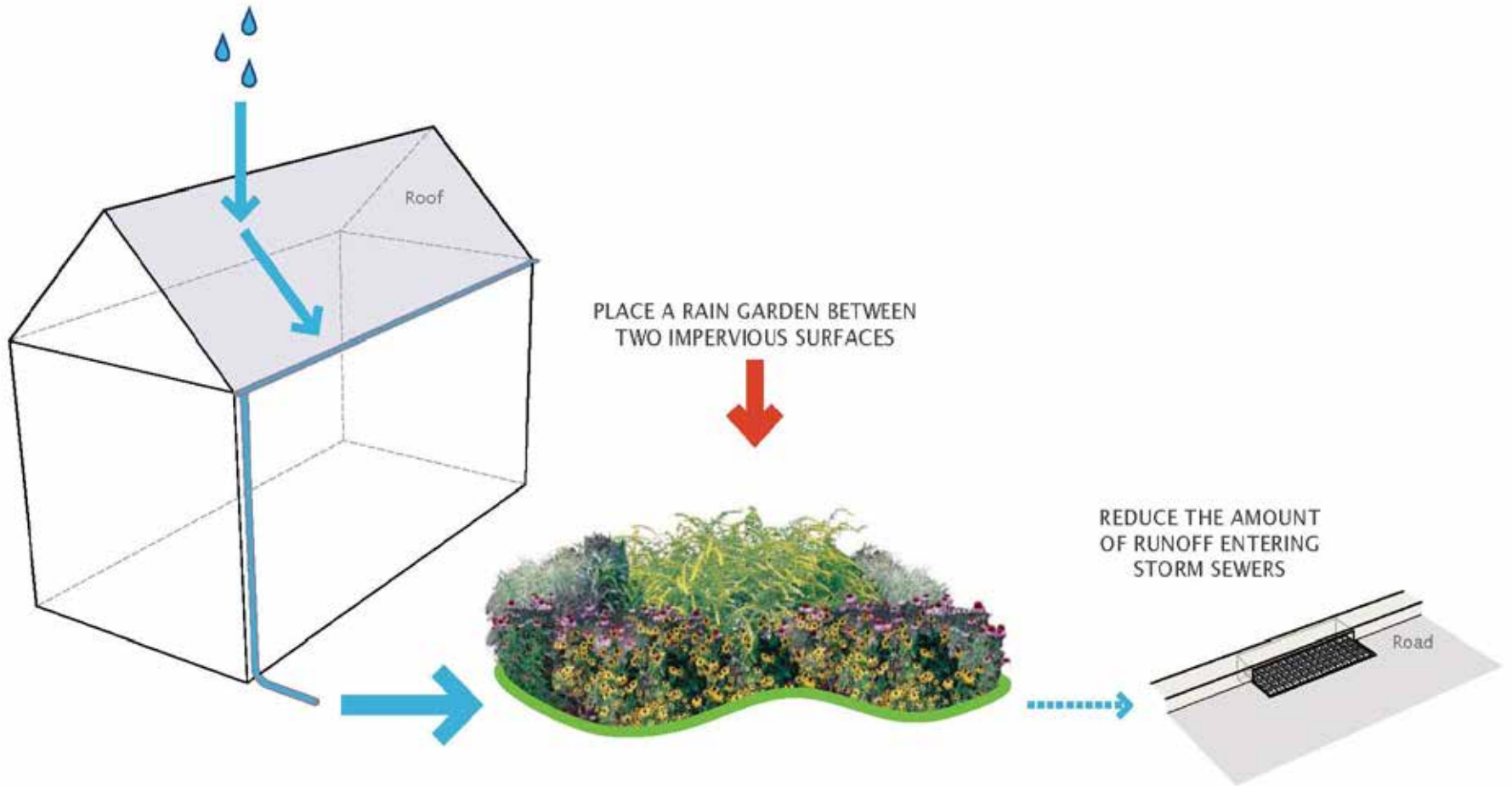
→ *more stormwater runoff*



Connected or Disconnected?



The Solution...

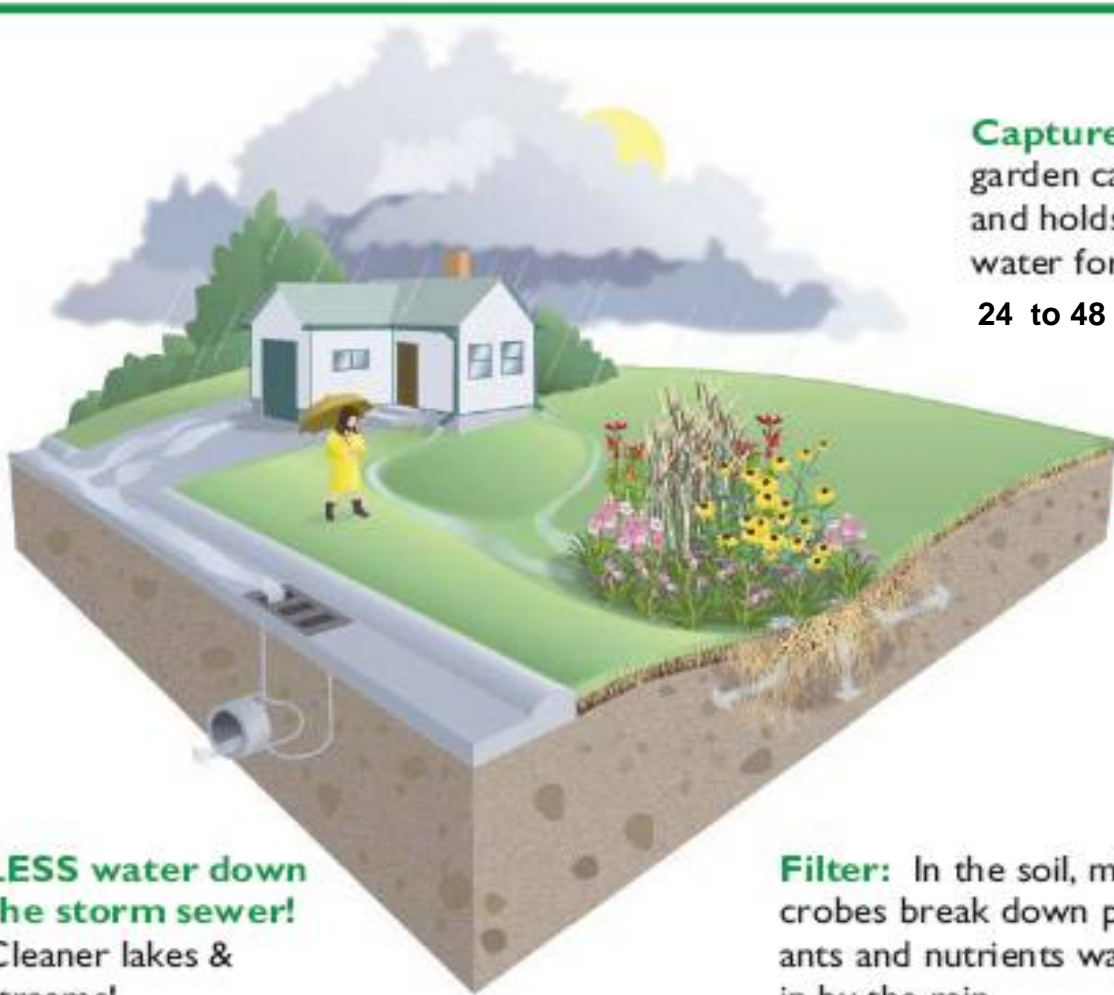


Rain Gardens

A rain garden is a landscaped, shallow depression that is designed to intercept, treat, and infiltrate stormwater at the source before it becomes runoff. The plants used in the rain garden are native to the region and help retain pollutants that could otherwise harm nearby waterways.



Rain Gardens



Capture: A rain garden catches runoff and holds standing water for no more than **24 to 48 hours.**

Soak: Deep-rooted plants loosen the soil, creating a sponge zone. Water soaks in and groundwater aquifers are recharged.

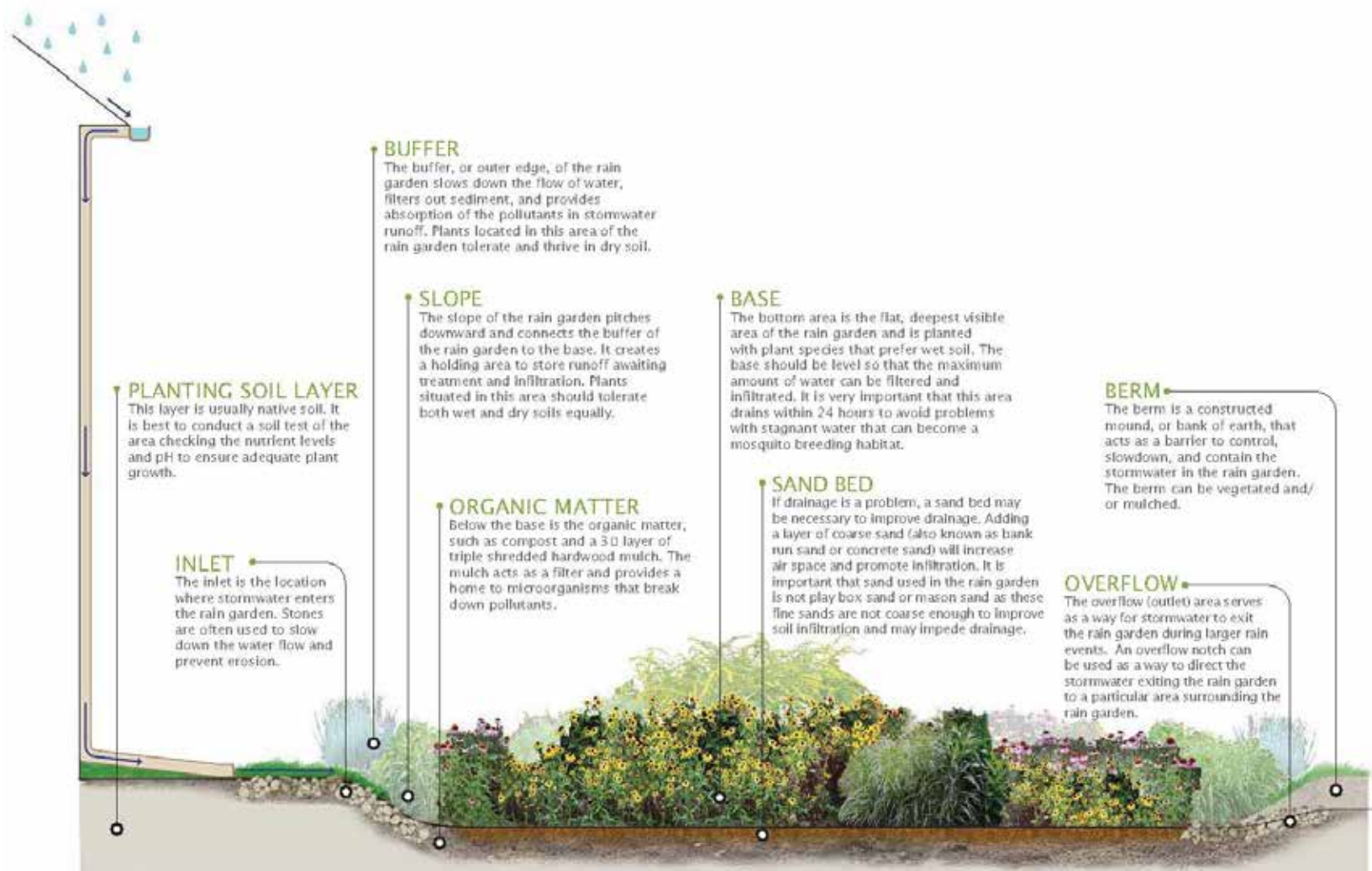
LESS water down the storm sewer!
Cleaner lakes & streams!

Filter: In the soil, microbes break down pollutants and nutrients washed in by the rain.

Courtesy of City of Maplewood, MN



PARTS OF A RAIN GARDEN



PLANTING SOIL LAYER

This layer is usually native soil. It is best to conduct a soil test of the area checking the nutrient levels and pH to ensure adequate plant growth.

INLET

The inlet is the location where stormwater enters the rain garden. Stones are often used to slow down the water flow and prevent erosion.

BUFFER

The buffer, or outer edge, of the rain garden slows down the flow of water, filters out sediment, and provides absorption of the pollutants in stormwater runoff. Plants located in this area of the rain garden tolerate and thrive in dry soil.

SLOPE

The slope of the rain garden pitches downward and connects the buffer of the rain garden to the base. It creates a holding area to store runoff awaiting treatment and infiltration. Plants situated in this area should tolerate both wet and dry soils equally.

ORGANIC MATTER

Below the base is the organic matter, such as compost and a 3" layer of triple shredded hardwood mulch. The mulch acts as a filter and provides a home to microorganisms that break down pollutants.

BASE

The bottom area is the flat, deepest visible area of the rain garden and is planted with plant species that prefer wet soil. The base should be level so that the maximum amount of water can be filtered and infiltrated. It is very important that this area drains within 24 hours to avoid problems with stagnant water that can become a mosquito breeding habitat.

SAND BED

If drainage is a problem, a sand bed may be necessary to improve drainage. Adding a layer of coarse sand (also known as bank run sand or concrete sand) will increase air space and promote infiltration. It is important that sand used in the rain garden is not play box sand or mason sand as these fine sands are not coarse enough to improve soil infiltration and may impede drainage.

BERM

The berm is a constructed mound, or bank of earth, that acts as a barrier to control, slowdown, and contain the stormwater in the rain garden. The berm can be vegetated and/or mulched.

OVERFLOW

The overflow (outlet) area serves as a way for stormwater to exit the rain garden during larger rain events. An overflow notch can be used as a way to direct the stormwater exiting the rain garden to a particular area surrounding the rain garden.



SITE SELECTION & DESIGN

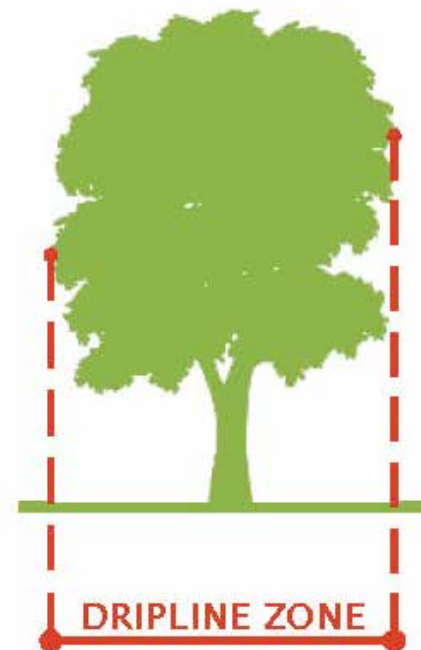
PLANNING YOUR RAIN GARDEN





SITE SELECTION

1. Next to a building with a basement, rain garden should be located min. 10' from building; no basement: 2' from building
2. Do not place rain garden within 25' of a septic system
3. Do not situate rain garden in soggy places where water already ponds
4. Avoid seasonably-high water tables within 2' of rain garden depth
5. Consider flat areas first – easier digging
6. Avoid placing rain garden within dripline of trees
7. Provide adequate space for rain garden













Rain Garden
Water Quality and Runoff
Enhancement Project

This garden is designed to intercept, treat, and infiltrate stormwater at the source, before it becomes runoff. The plants are native to the region and help retain pollutants that could otherwise harm nearby waterways.

Rain gardens are beautiful, low-maintenance, and inexpensive gardens that you can install at home.

www.water.rutgers.edu





CALL BEFORE YOU DIG

LOCATE YOUR UTILITY LINES!

Call BEFORE You Dig!

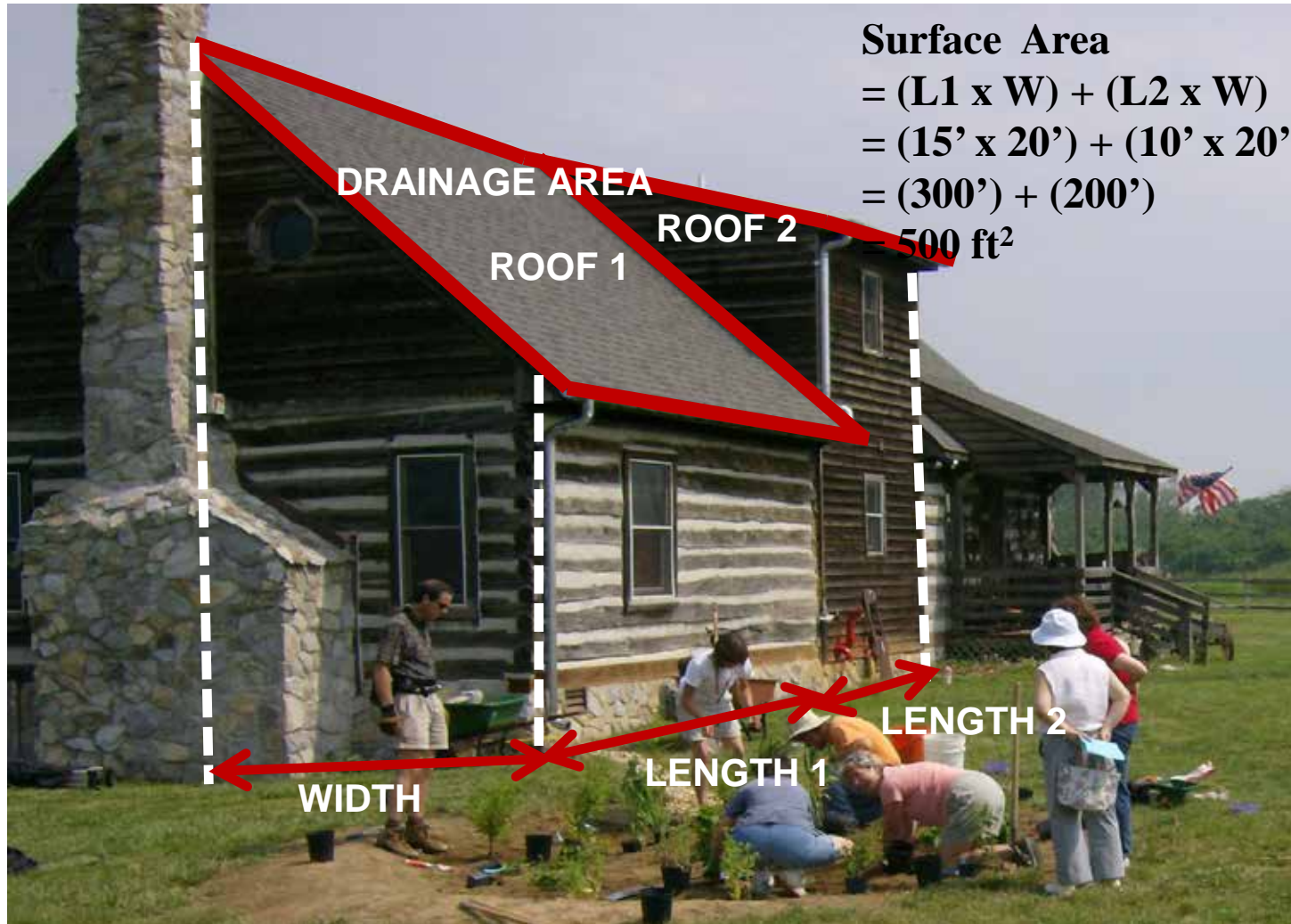
*NJ One Call
1-800-272-1000*

The different colors of the markout flags represent specific utilities.

	ELECTRIC
	GAS, OIL, STEAM
	COMMUNICATIONS, CATV
	WATER
	SEWER

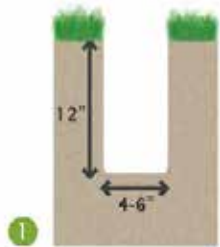
- **NJ One Call: 1-800-272-1000**
- Free markout of underground gas, water, sewer, cable, telephone, and electric utility lines
- Call at least 3 full working days, but not more than 10 days, prior to planned installation date
- Do not place rain garden within 5' horizontally and 1' vertically from any utilities

DRAINAGE AREA CALCULATION





CHECK YOUR SOIL



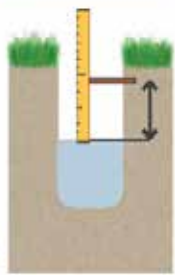
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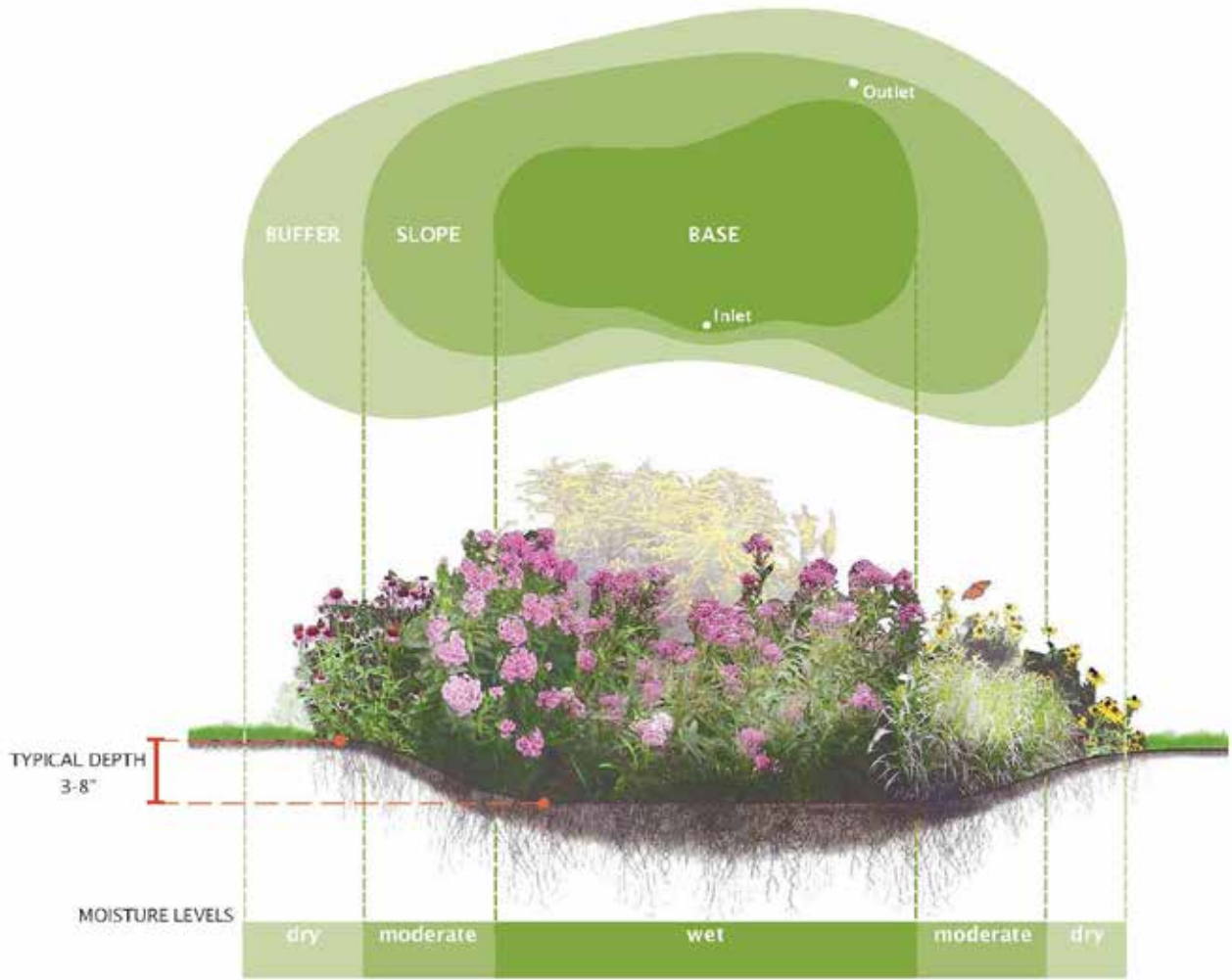


4

- Infiltration/Percolation Test

1. Dig a hole in the proposed rain garden site (12" deep, 4-6" wide)
2. Fill with water to saturate soil and then let stand until all the water has drained into the soil
3. Once water has drained, refill the empty hole again with water so that the water level is about 1" from the top of the hole
4. Check depth of water with a ruler every hour for at least 4 hours
5. Calculate how many inches of water drained per hour

DETERMINING THE DEPTH OF THE RAIN GARDEN



DETERMINING THE DEPTH OF THE RAIN GARDEN



6" DEEP RAIN GARDEN - NO SOIL AMENDMENTS



3" DEEP RAIN GARDEN - SOIL AMENDMENTS



- Depth of rain garden is dependent upon the soil texture found at the site of the rain garden
- Depth is usually 3-8 inches

DETERMINING THE SIZE OF THE RAIN GARDEN



- The size of the rain garden is dependent upon the amount of runoff entering the rain garden

Rain Garden Sizing Table

Based on New Jersey's Water Quality Design Storm (1.25" of rain over 2 hours)

Drainage Area	Size of 3" Deep Rain Garden CLAY SOIL*	Size of 6" Deep Rain Garden SILTY SOIL	Size of 8" Deep Rain Garden SANDY SOIL
500 ft ²	200 ft ²	100 ft ²	75 ft ²
750 ft ²	350 ft ²	150 ft ²	112 ft ²
1,000 ft ²	400 ft ²	200 ft ²	149 ft ²
1,500 ft ²	600 ft ²	300 ft ²	224 ft ²
2,000 ft ²	800 ft ²	400 ft ²	299 ft ²

*SOIL TEXTURE AMENDMENTS NEEDED

SOIL TEXTURE AMENDMENTS

- Soil texture amendments improve the rain garden's infiltration rate.



SOIL QUALITY AMENDMENTS

- Soil quality amendments improve the rain garden's growing conditions for plants
- Improve soil's nutrient capacity



REMEMBER:

Your rain garden should NOT be permanently filled with water – it should drain within 24 hours.



DETERMINING THE INLET AND OVERFLOW

- Stormwater runoff enters the rain garden from an **inlet**
- Stormwater exits through the **overflow**





PREVENTING EROSION

- Slope no greater than 3:1
- Slow down velocity of water flowing through rain garden
 - Add rocks to inlet area



DETERMINING MULCH QUANTITY



- Allow for a 3” depth mulch (triple-shredded hardwood with no dye) to be spread throughout the entire rain garden
- Every 100 square feet of rain garden needs 1 cubic yard (3” depth)



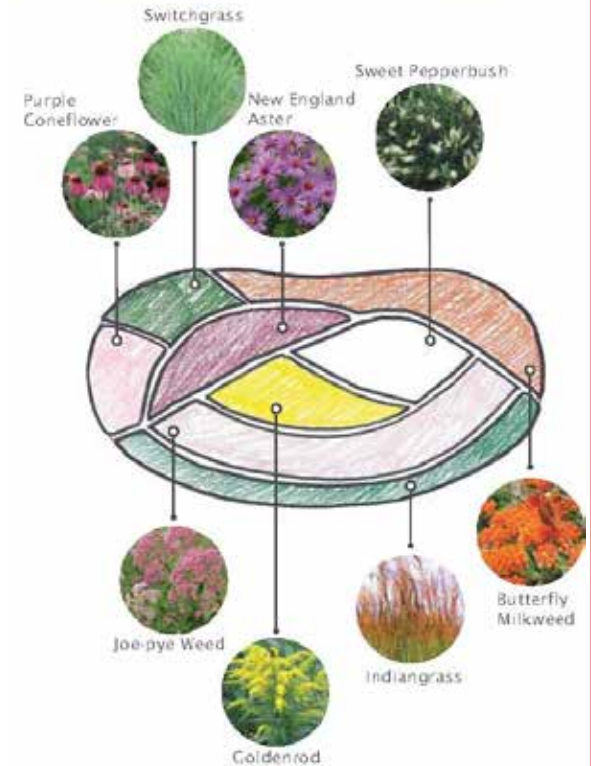


RAIN GARDEN DESIGN

SHAPING YOUR RAIN GARDEN

- Use a garden hose or rope to outline the desired shape of your rain garden on the ground
- Many rain gardens are in the shape of a circle or kidney bean, but your rain garden can take on whatever shape you prefer

Butterfly Habitat Rain Garden: Planting Plan



May



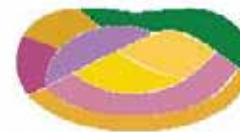
June



July



August



September



October

SELECTING PLANTS FOR YOUR RAIN GARDEN



- The success of your rain garden depends on selecting the right plants for the right place
- Plant your rain garden with plants adapted for your specific site
- **Native plants** can thrive without a lot of care, extra water, fertilizer, or pesticides
- **Native plants** are tolerant to dry and wet conditions

DESIGN AESTHETICS

- Formal or traditional design
 - Shrub bed
 - Perennial garden
 - Hedges
- Naturalized planting & design
 - Butterfly garden
 - Meadow (warm season grasses & wildflowers)
 - Buffer plantings



SITE CONSTRAINTS

- Sun vs. shade
- Exposure/wind
- Soil characteristics
- Hydrologic conditions
- Road salts
- Vehicle/pedestrian traffic



PLANTS IN THE RIGHT PLACE...



Courtesy of Pinelands Nursery & Supply



PLANT SELECTION

Select species based upon the following qualities:

- Plant size
- Moisture tolerances
- Sun preferences
- Plant aggressiveness
- Salt tolerance
- Habitat creation



PLANT SELECTION

- Mature plant size
 - Proximity to buildings and utility lines
 - Pruning and shaping
- Seasonal interest
 - Flowers
 - Fall color
 - Winter character
- Beneficial wildlife
 - Flowers for butterflies
 - Fruits for song birds





PLANTING DESIGN TIPS

- Plants that prefer wet conditions should be planted in the deepest part (the base) of the rain garden
- Create depth in the rain garden by placing large and tall plants in the back, smaller plants in the front
- Plant masses of the same species together in odd numbers
- Incorporate plants that have visual interest in the fall and winter
- Native plants provide habitat to animals and require less watering

PLANTING DESIGN: Mature Size of Plants



At time of installation

Springfield Township Municipal Annex Building
Springfield, NJ



First growing season



Second growing season



Third growing season



Fourth growing season



THE FUN PART!

INSTALLING YOUR RAIN GARDEN



STEP ONE

- Delineate rain garden area



- Remove existing grass with a shovel or machinery



STEP TWO

- Excavate to design depth based on necessary storage and soil amendment requirements



STEP THREE

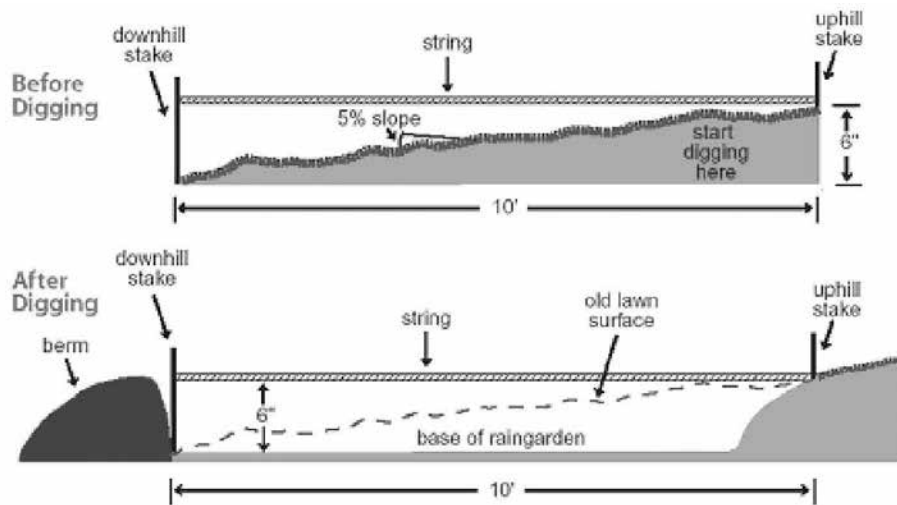
- Add soil amendments, if necessary



- Combine amendments with existing soil using shovels or rototiller
- Loosen and prepare soil for grading and planting

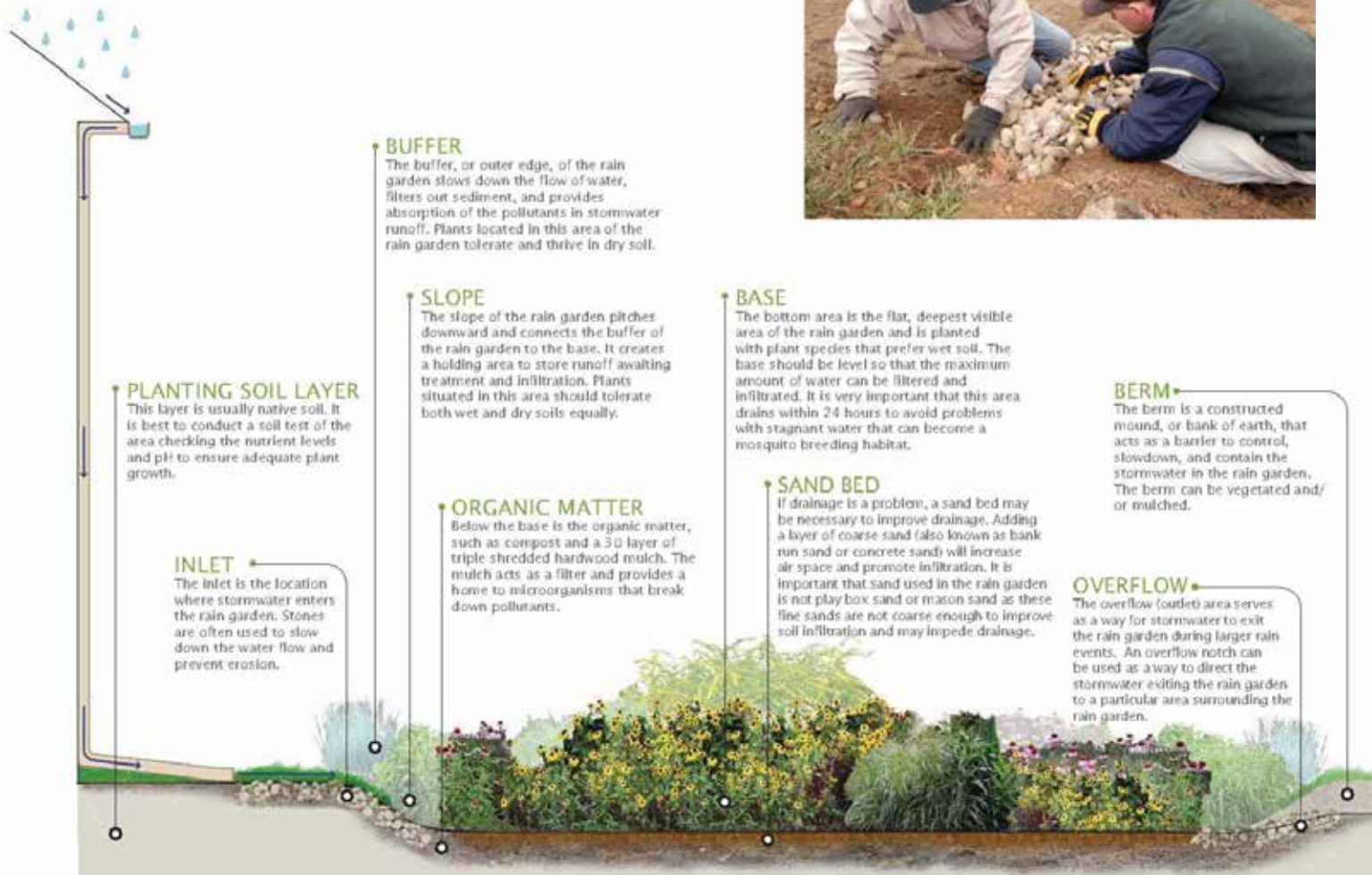
STEP FOUR

- Prepare the berm, if necessary



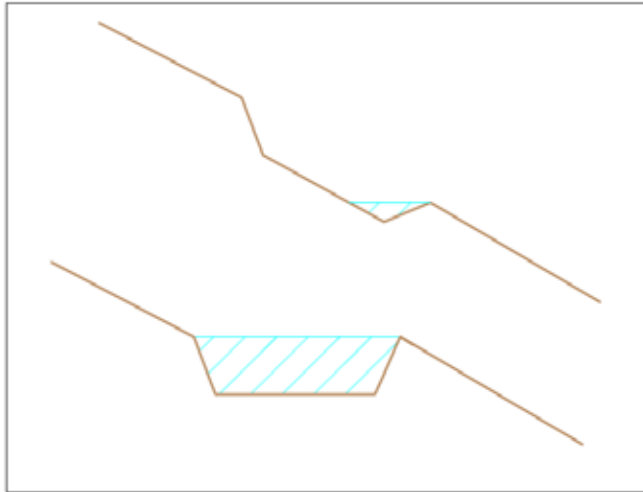
STEP FIVE

- Prepare the overflow



STEP SIX

- Level the rain garden base



STEP SEVEN

- Plant native species



STEP EIGHT

- Apply mulch



- Allow for a 3” depth mulch (triple-shredded hardwood with no dye) to be spread throughout the entire rain garden
- For every 100 square feet of rain garden, you will need about 1 cubic yard of mulch (3” depth)

STEP NINE

- Water Plants



STEP TEN

- Appreciate a job well done





INSPECTION AND MAINTENANCE

MAINTAINING YOUR RAIN GARDEN



MAINTENANCE MEASURES

WEEKLY TASKS:

1. Watering
2. Weeding
3. Inspecting

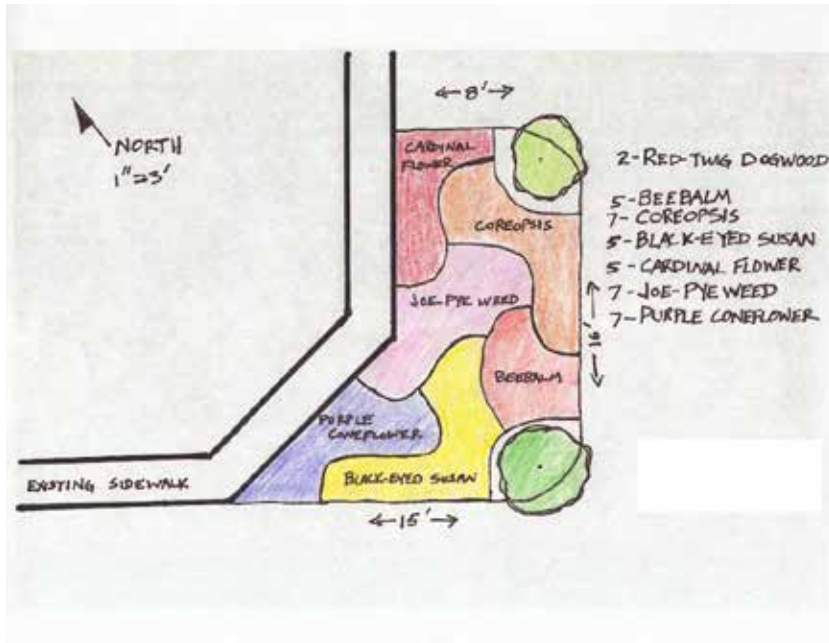
ANNUAL TASKS:

1. Mulching
2. Pruning
3. Re-planting
4. Removing sediment
5. Soil Testing
6. Harvesting Plants
7. Cleaning of Gutters
8. Replacing materials (stone, landscape fabric)

Completed Rain Gardens

Roof Runoff

Design



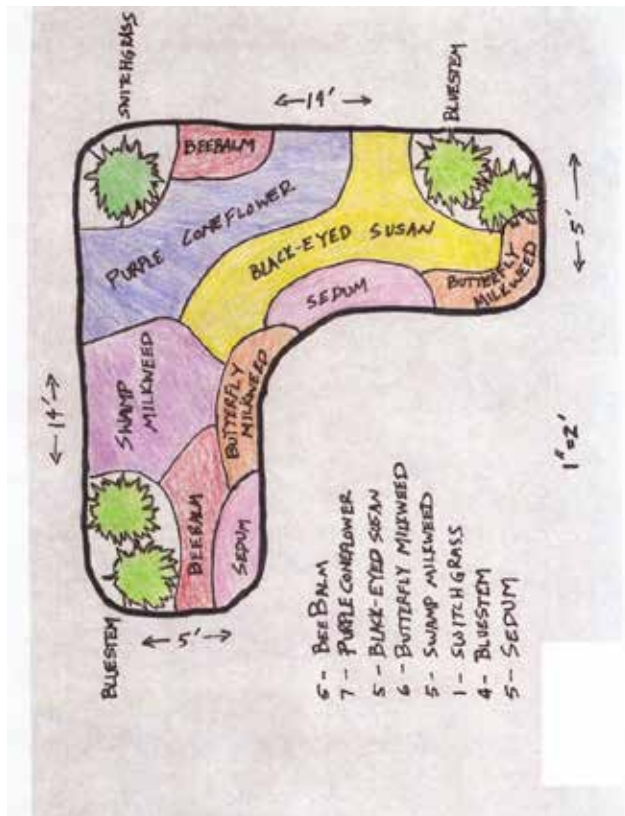
Installed Rain Garden





Parking Lot Runoff

Design



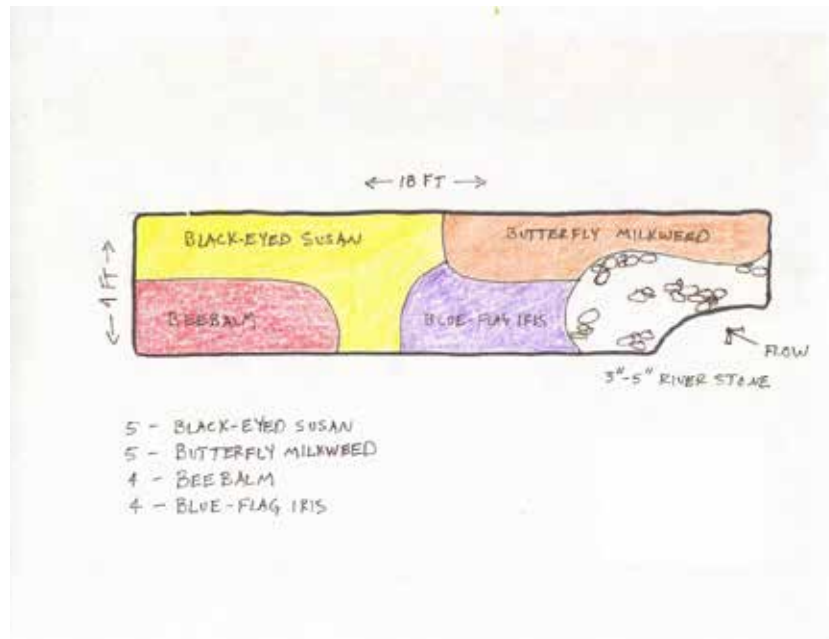
Installed Rain Garden





Roof, Sump Pump and Driveway Runoff

Design



Installed Rain Garden

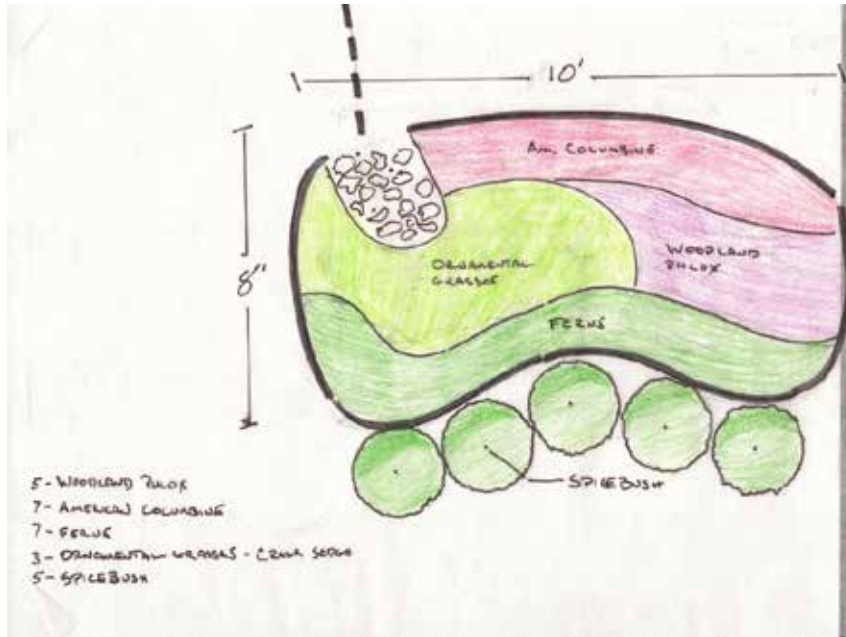




Roof Runoff

Design

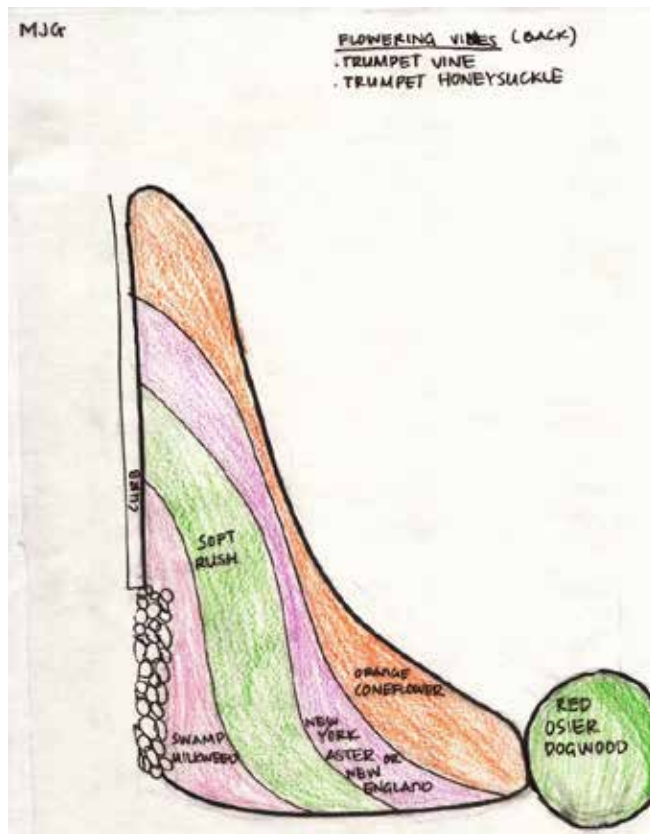
Installed Rain Garden





Driveway Runoff

Design



Rain Garden Installed

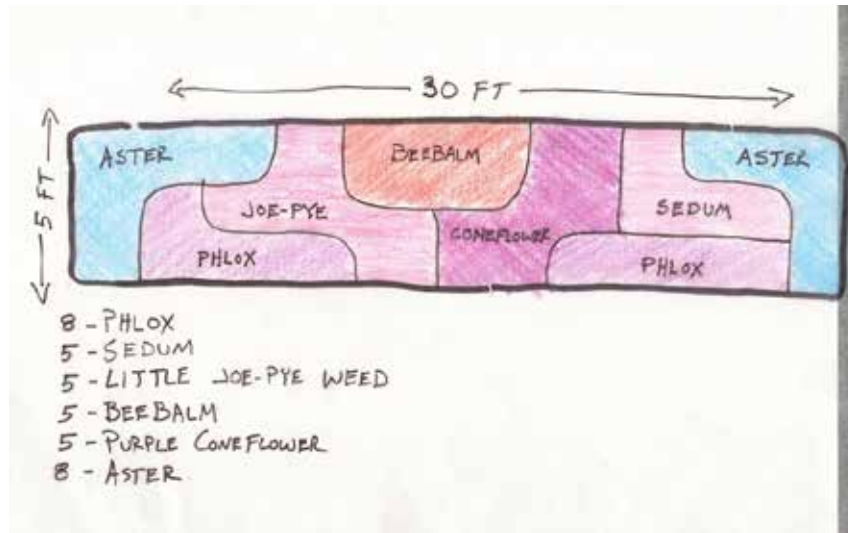




Driveway Runoff

Design

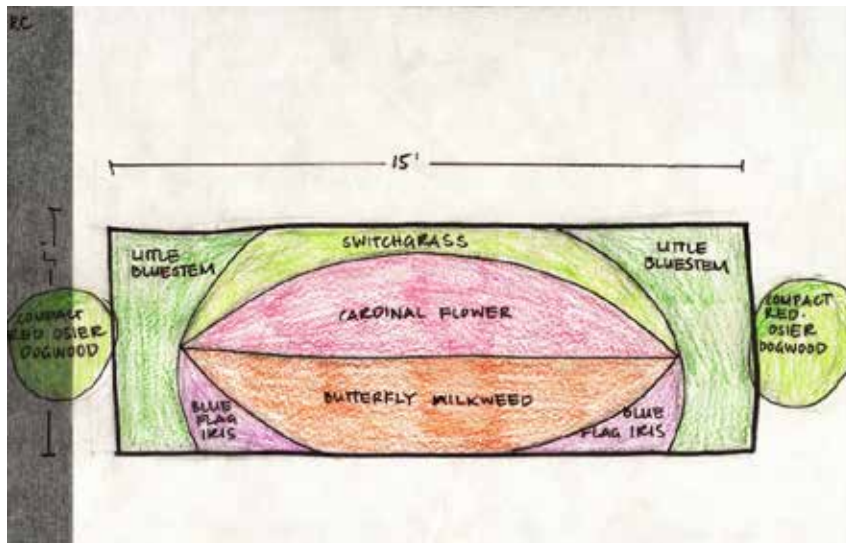
Installed Rain Garden





Roof Runoff from Rain Barrel Overflow

Design



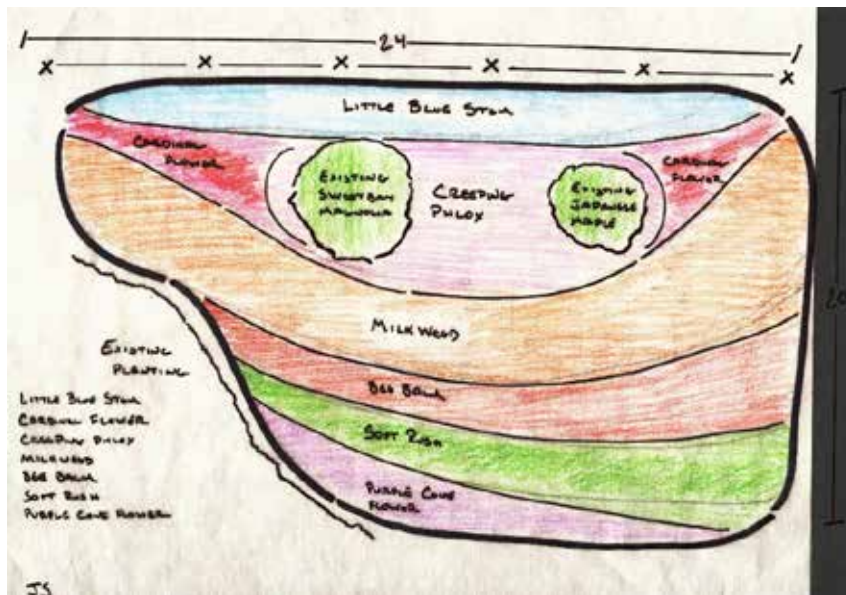
Installed Rain Garden





Roof Runoff

Design

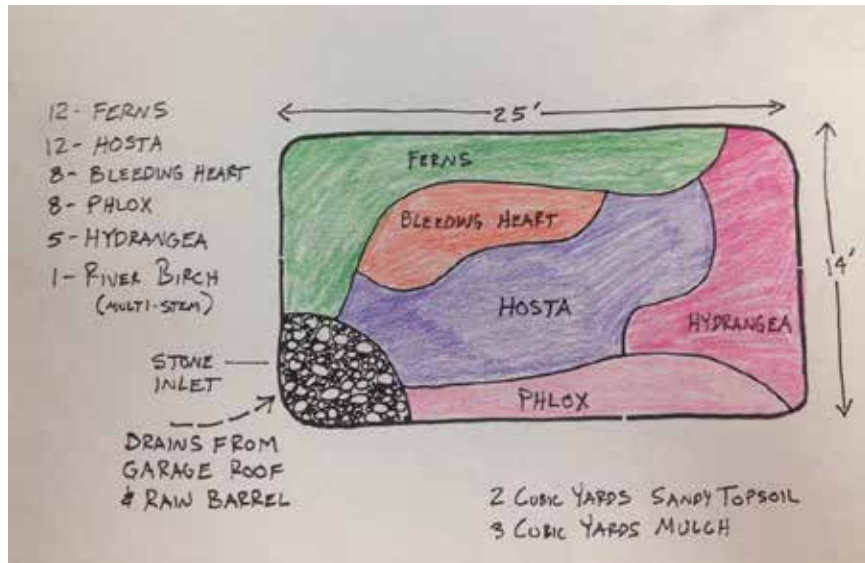


Installed Rain Garden





Garage Roof Runoff and Rain Barrel Overflow





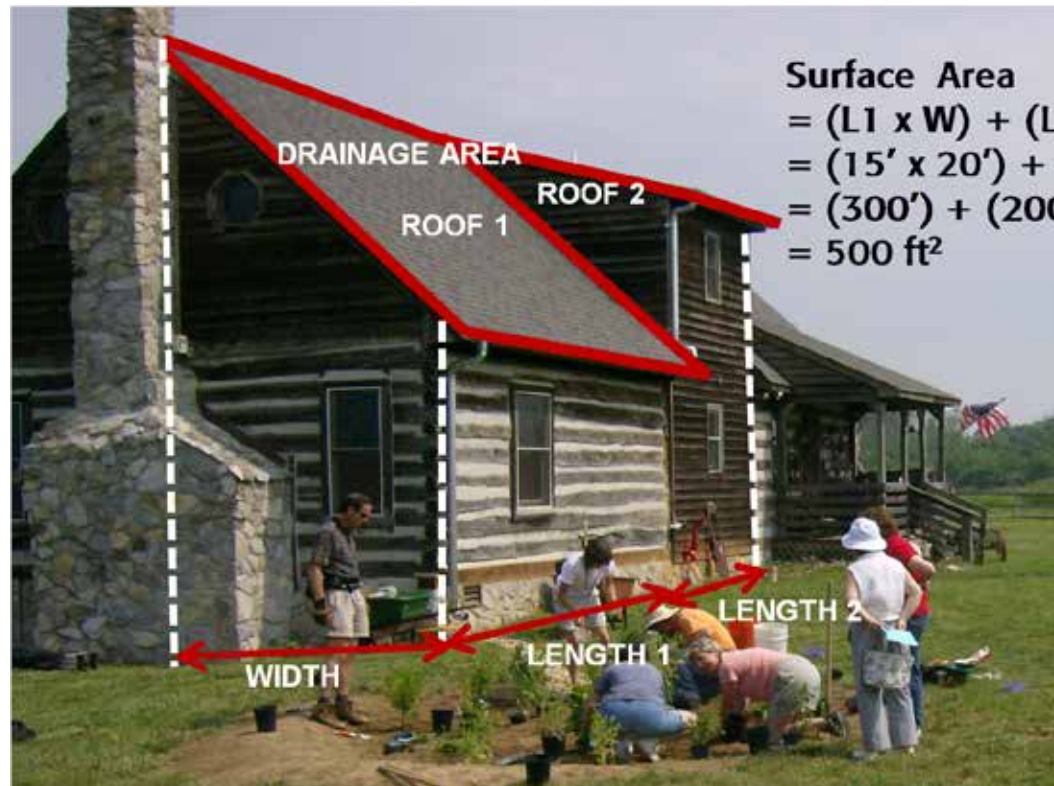
Take Home Handouts

Handout Guidance

Impervious Surfaces:

- Rooftop(s)
- Driveway(s)
- Walkway(s)
- Deck(s)
- Patio(s)
- Shed(s)

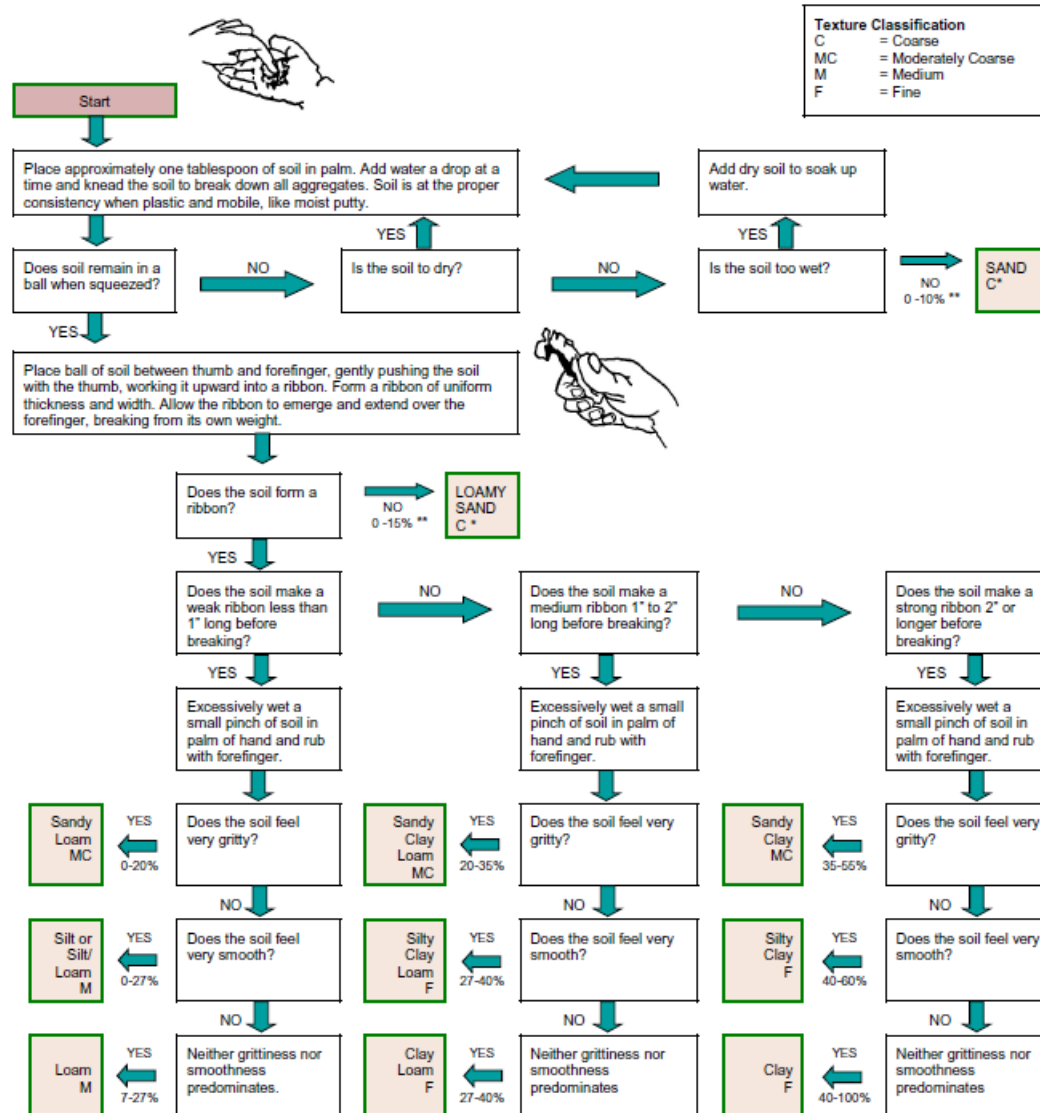
Drainage Area:



Surface Area

$$\begin{aligned} &= (L1 \times W) + (L2 \times W) \\ &= (15' \times 20') + (10' \times 20') \\ &= (300') + (200') \\ &= 500 \text{ ft}^2 \end{aligned}$$

Determining Soil Texture by the "Feel Method"



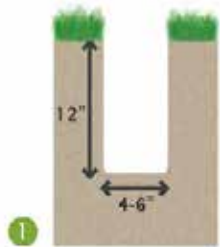
* Sand Particle size should be estimated (very fine, fine, medium, coarse) for these textures. Individual grains of very fine sand are not visible without magnification and there is a gritty feeling to a very small sample ground between the teeth. Some fine sand particles may be just visible. Medium sand particles are easily visible. Examples of sand size descriptions where one size is predominant are: very fine sand, fine sandy loam, loamy coarse sand.

** Cay percentage range.

Modified from: Thien, Steven J., Kansas state University, 1979 Jour. Agronomy education.



CHECK YOUR SOIL



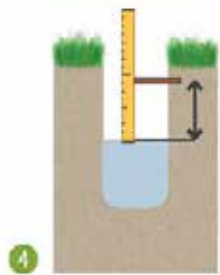
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2



3



4

- Infiltration/Percolation Test

1. Dig a hole in the proposed rain garden site (12" deep, 4-6" wide)
2. Fill with water to saturate soil and then let stand until all the water has drained into the soil
3. Once water has drained, refill the empty hole again with water so that the water level is about 1" from the top of the hole
4. Check depth of water with a ruler every hour for at least 4 hours
5. Calculate how many inches of water drained per hour

With sandy soils, the water should descend quickly. With clay soils, the water should descend slowly.

If the drainage rate is less than 1.5 inches per hour, or the water does not drain within 24 hours, add soil texture amendments such as coarse sand during installation. Alternatively, consider placing the rain garden in a different location on your property.

It is important to note that sometimes an infiltration test provides a false reading of a site's soil conditions. For example, during dry conditions, an infiltration test may demonstrate that the soil drains quickly and does not need amendments. However, during a rainy season, an infiltration test on that same soil may reveal that it is clayey and does not infiltrate well.

RAIN GARDEN DESIGN FORM



HOW BIG DO YOU WANT YOUR RAIN GARDEN TO BE?

_____ FEET LONG X _____ FEET WIDE

WHAT ARE THE GARDEN SITE'S CONDITIONS?

SUN	<input type="checkbox"/> Full shade	<input type="checkbox"/> Partial shade	<input type="checkbox"/> Sunny
SOIL	<input type="checkbox"/> Sandy soil	<input type="checkbox"/> Loam soil	<input type="checkbox"/> Clay soil
DRAINAGE	<input type="checkbox"/> Well drained	<input type="checkbox"/> Poorly drained	<input type="checkbox"/> Compacted
SLOPE	<input type="checkbox"/> Flat	<input type="checkbox"/> Slight	<input type="checkbox"/> Steep

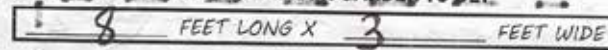
Prior to technical support session, please email this form along with your photos to Sara at saramellor@envsci.rutgers.edu

RAIN GARDEN DESIGN FORM

INTEND TO
PLANT IN
SEPTEMBER, 2014



HOW BIG DO YOU WANT YOUR RAIN GARDEN TO BE?



WHAT ARE THE GARDEN SITE'S CONDITIONS?

SUN	<input type="checkbox"/> Full shade	<input checked="" type="checkbox"/> Partial shade	<input type="checkbox"/> Sunny
SOIL	<input type="checkbox"/> Sandy soil	<input type="checkbox"/> Loam soil	<input checked="" type="checkbox"/> Clay soil
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SLOPE	<input type="checkbox"/> Flat	<input checked="" type="checkbox"/> Slight	<input type="checkbox"/> Steep

HOW MUCH OF YOUR PROPERTY IS
MADE UP OF IMPERVIOUS SURFACES?

_____ SQ. FT

WHAT IS THE DRAINAGE AREA OF YOUR
PROPOSED RAIN GARDEN SITE?

_____ SQ. FT

DO YOU HAVE A BASEMENT?

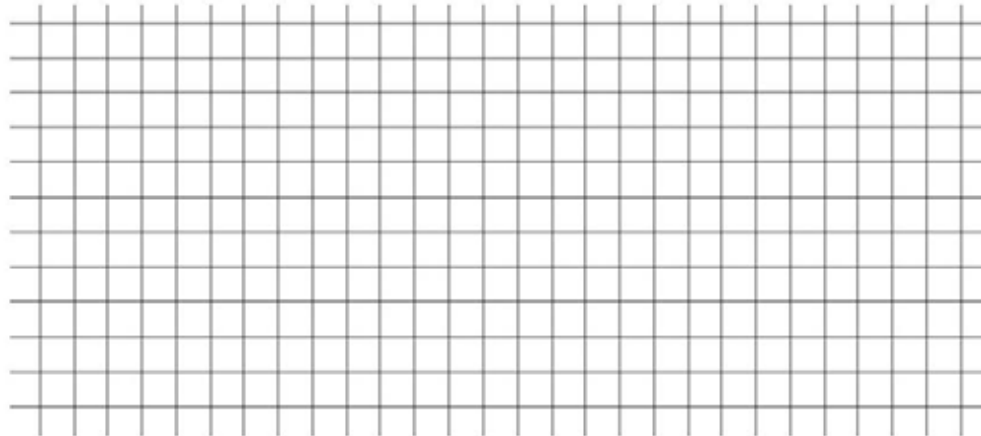
YES

NO

LANDSCAPE DESIGN PLAN

Draw a plan of your Rain Garden location, including the maximum area you are willing to dedicate to the garden. Please also attach a photo or two of the proposed area and mark on the plan where each photo was taken and the view it shows. Consider and include these details in your sketch on the graph paper below.

- *Activities in your yard (i.e. kids playing, grilling, washing your car):* _____
- *Irrigation zones if applicable (i.e. sprinkler systems, drip irrigation):* _____
- *Sun/shade, wet/dry, steep slope, drainage patterns:* _____
- *Color preference for plants:* _____
- *Plant height restrictions:* _____
- *Block and hatch existing plants you want to keep*



COMMON LANDSCAPE SYMBOLS



(BACK YARD ONLY)

HOW MUCH OF YOUR PROPERTY IS
MADE UP OF IMPERVIOUS SURFACES?

200 SQ. FT

WHAT IS THE DRAINAGE AREA OF YOUR
PROPOSED RAIN GARDEN SITE?

24 SQ. FT

DO YOU HAVE A BASEMENT?

YES

NO

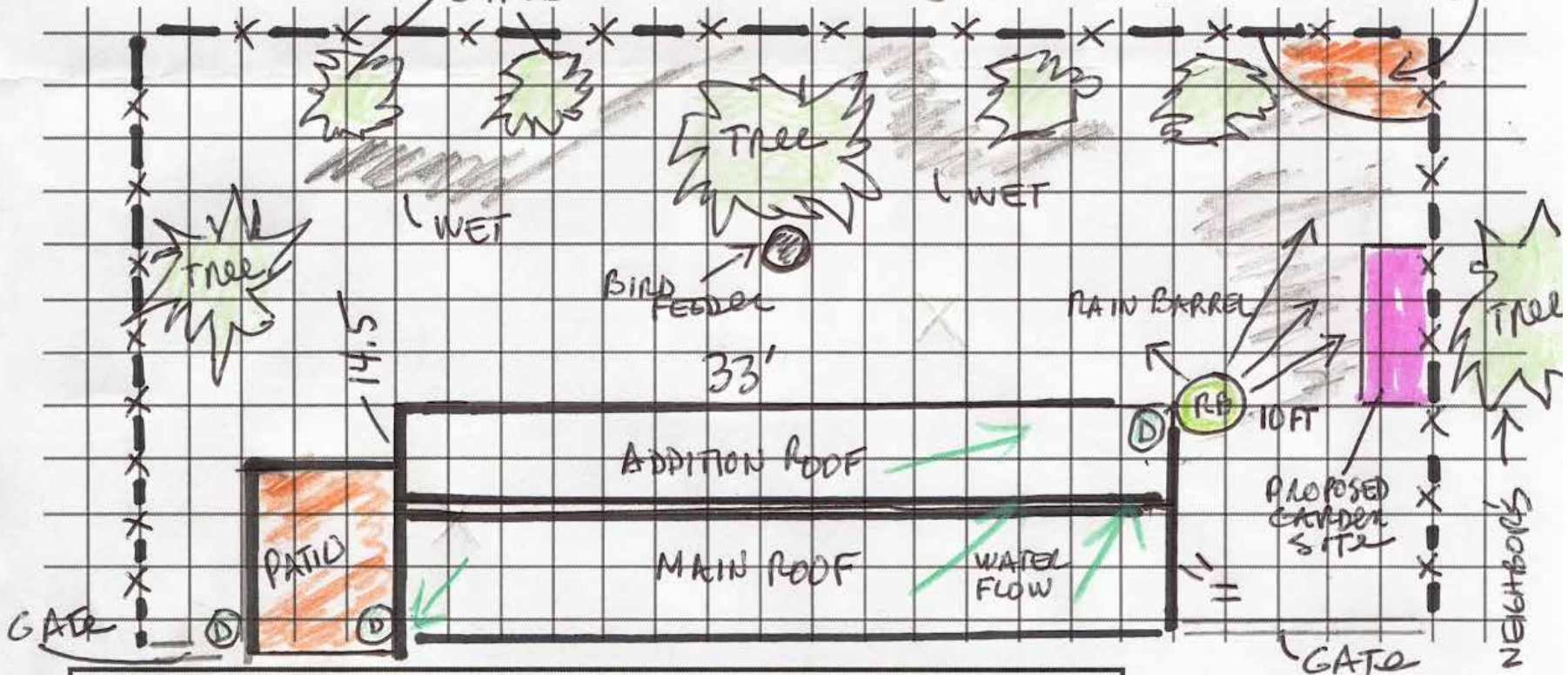
LANDSCAPE DESIGN PLAN

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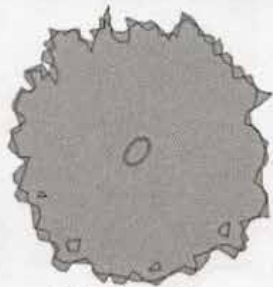
- Activities in your yard (i.e. kids playing, grilling, washing your car):
PLAYING WITH DOG, BIRD FEEDER, GRILLING, MOWING LAWN
- Irrigation zones if applicable (i.e. sprinkler systems, drip irrigation):
NONE
- Sun/shade, wet/dry, steep slope, drainage patterns:
AS INDICATED. ENTIRE BACK YARD SUBTLE SLOPE ↑
- Color preference for plants: MIXED
- Plant height restrictions: DESIGNED; TIERED - LOW, MEDIUM, HIGH

ROCK,
CLAY
MOUND

- Block and hatch existing plants you want to keep (BACKYARD SHOWN)



COMMON LANDSCAPE SYMBOLS



Existing Tree



Existing Shrub



Downspout



Photo



Property Line



Fence Line



Drainage (flow direction)



Area Draining



Plants to Keep



Paved Surface



Thank you for attending!

Sign up now for the Rain Garden Design Workshop
on

Tuesday, May 26th

This program sponsored by Hamilton Township through its ongoing
partnership with the
Rutgers Cooperative Extension Water Resources Program.

For more information contact:

Jeremiah Bergstrom
jbergstrom@envsci.rutgers.edu

Chris Perez
cperez@envsci.rutgers.edu