

RUTGERS

New Jersey Agricultural
Experiment Station



Sighting and Installing a Rain Garden



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Rutgers Cooperative Extension

Water Resources Program

<http://water.rutgers.edu>

Landscaper Training Program

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- Rain gardens were constructed by the Rutgers Master Gardeners of Gloucester County
- **GOAL:** To have the rain gardens serve as a model for county residents who are interested in controlling polluted runoff and to help recharge the groundwater

Dorsett Arabian Horse Farm



Gloucester County 4-H Fairgrounds



RCE of Gloucester County



Holy Nativity Lutheran Church



Greenwich Township Library



- Shallow landscaped depression that treats stormwater runoff.
- Designed to merge two important goals: aesthetics and water quality
- Can be blended into the landscape and made to look natural.
- Water is directed into them by pipes, swales, or curb openings.

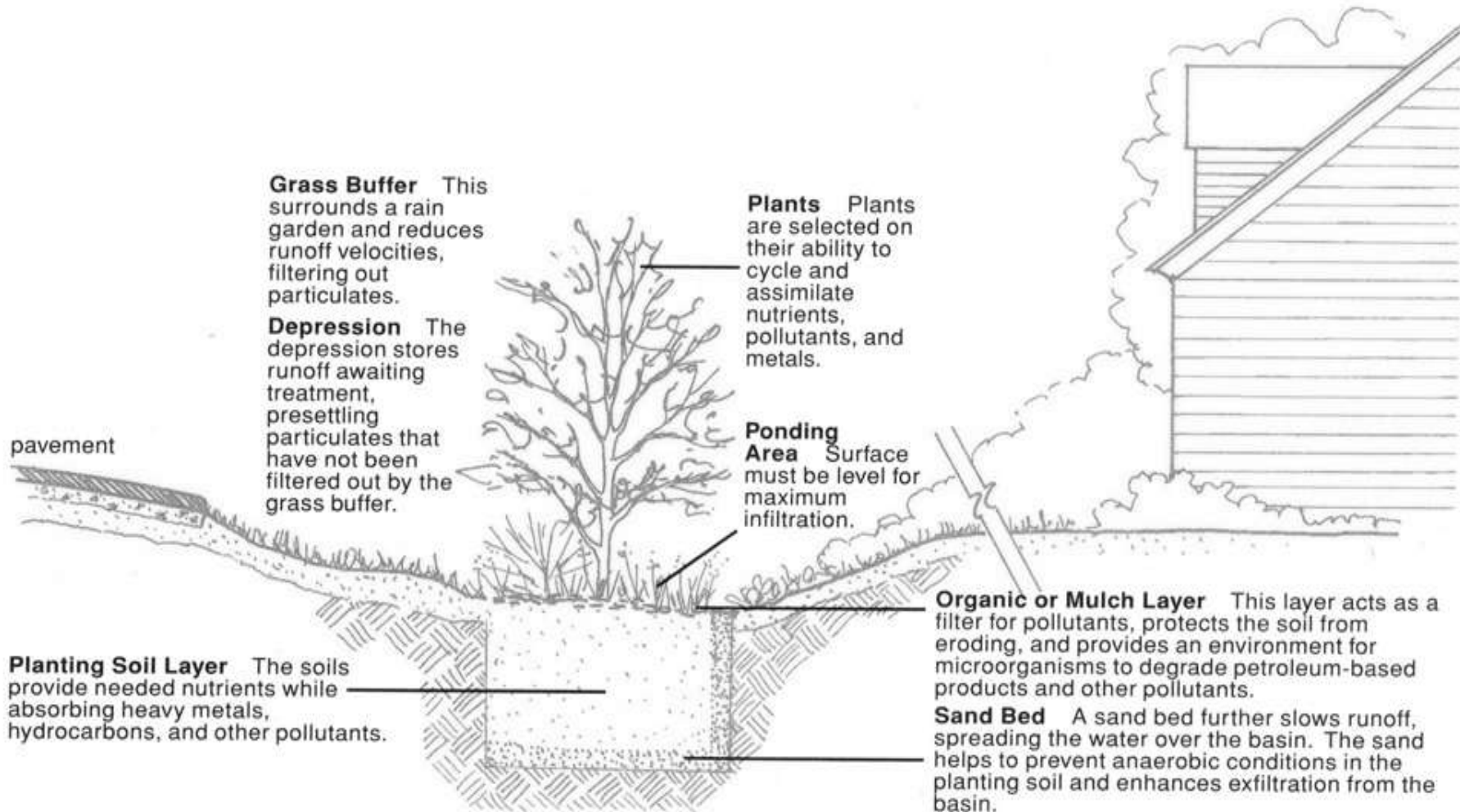




- Designed to intercept, treat, and infiltrate stormwater at the source before it becomes runoff
- Provides very high pollutant removal efficiencies
- Can be incorporated into the landscapes of many locations



The Parts of a Rain Garden

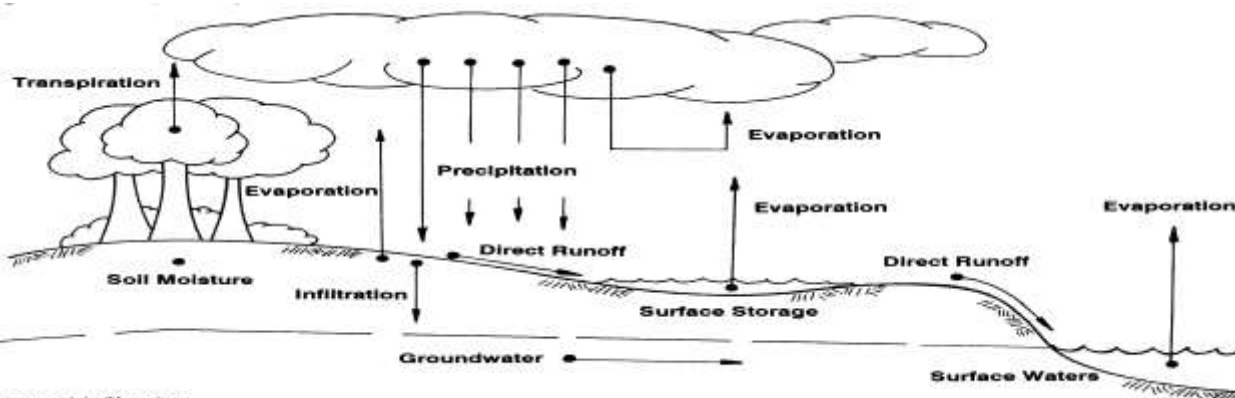
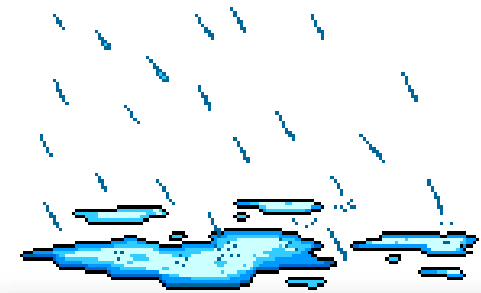


- Absorption to soil particles
 - *Removes dissolved metals and soluble phosphorus*
- Plant uptake
 - *Removes small amounts of nutrients*
- Microbial processes
 - *Removes organics and pathogens*
- Exposure to sunlight and dryness
 - *Removes pathogens*
- Sedimentation and filtration
 - *Removes total suspended solids, floating debris, trash, soil-bound phosphorus, some soil-bound pathogens*
- Infiltration of runoff
 - *Provides flood control, groundwater recharge, and nutrient removal*

NOTE: 90% of all storm events produce less than 1 inch of rain. Therefore, the key to reducing pollutant loads is to treat the runoff associated with the first 1 inch of rain (Clayton & Schueler, 1996).

How much water does a typical rain garden treat in a year?

- 90% of rainfall events are less than 1.25"
- New Jersey has approx. 44" of rain per year
- The rain garden will treat and recharge:
 $0.9 \times 44" = 40"/\text{year} = 3.3 \text{ ft}/\text{year}$
- The rain garden receives runoff from 1,000 sq.ft.
- Total volume treated and recharged by the rain garden is
 $1,000 \text{ sq. ft.} \times 3.3 \text{ ft}/\text{year} = 3,300 \text{ cubic feet}/\text{year}$,
which is 25,000 gallons/year
- ***Build 40 rain gardens and we have treated and recharged 1 million gallons of water per year!***



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Gloucester County
Soil Conservation District



Applying knowledge to improve water quality
**National
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How To Install a Rain Garden



3. Maintenance



2. Installation



1. Planning



- Identify Site
- Site Visit
- Design Calculations

1. Planning



Things to Remember

- The rain garden should be at least 10 feet from the house so infiltrating water doesn't seep into the foundation.
- Do not place the rain garden directly over a septic system.
- Do not put rain garden in places where the water already ponds or the lawn is always soggy.
- Place in full or partial sunlight as a first option
- Select a flat part of the yard for easier digging as a first option.
- Avoid large tree roots.

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Determine Existing Utility Lines



<http://www.nj1-call.org>

**NJ One Call:
811**



Identify the Drainage Area



Union County Vocational School

Before



Hockman Farm, Winchester, Virginia

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**Parking Lot/
Driveway**

Union County Vocational School

After



Roof

Hockman Farm, Winchester, Virginia

Parking Lot/ Driveway with a Curb Cut



Determine Current Stormwater Flow



If the area is prone to flooding, it may be difficult to improve the drainage.

Identify Drainage Problems



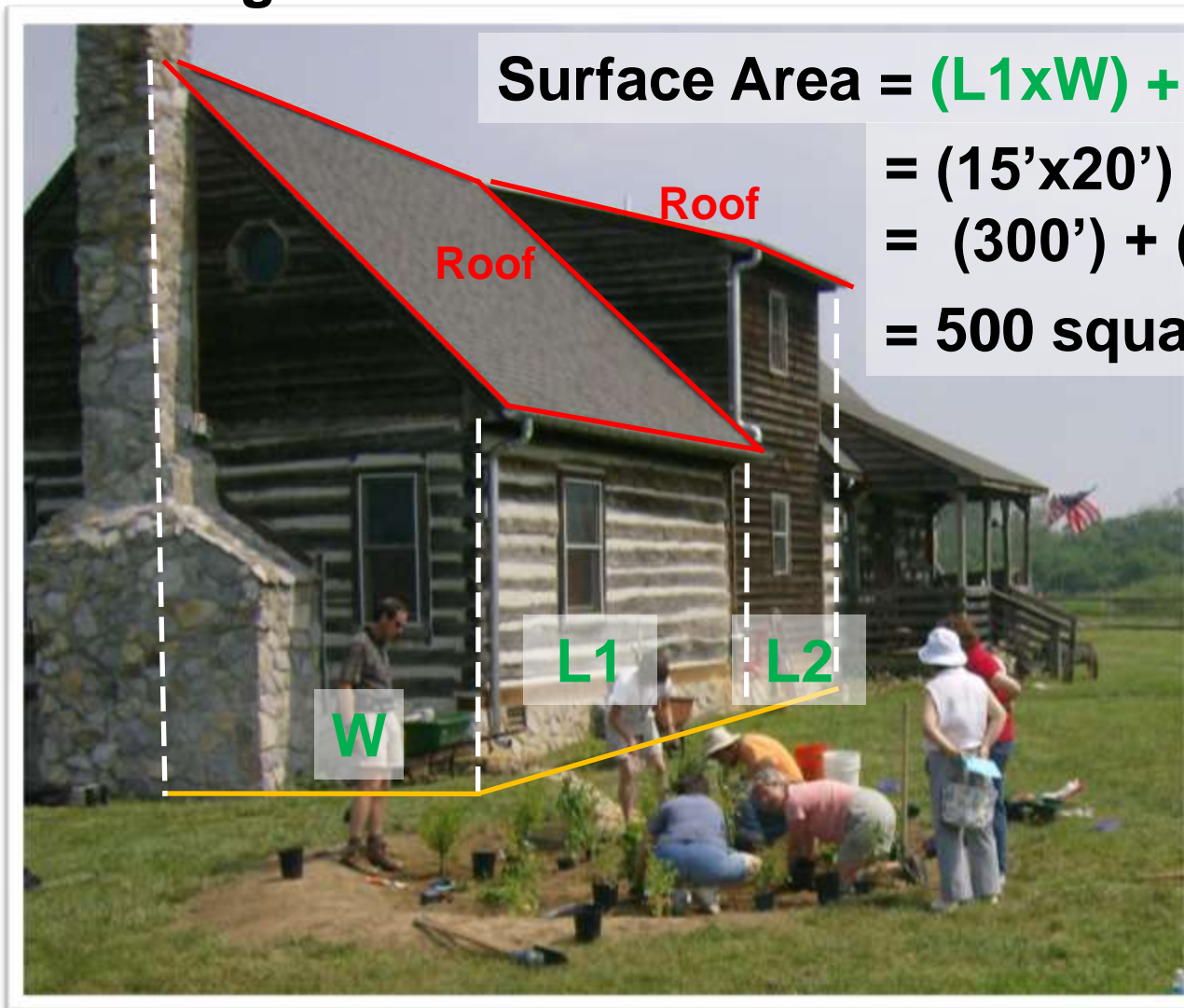
Union County Vocational School

Current Landscaping Practices



Union County Vocational School

Measure Drainage Area



$$\text{Surface Area} = (L1 \times W) + (L2 \times W)$$

$$= (15' \times 20') + (10' \times 20')$$

$$= (300') + (200')$$

$$= 500 \text{ square feet}$$

Hockman Farm, Winchester, Virginia

**Make observations
during storms to
estimate the
drainage area**

**Or use survey
equipment**



Measure Drainage Area

Rain Garden Sizing Table for New Jersey's Water Quality Design Storm

Surface Area of Impervious Surface to be Treated (sq. ft.) or (LxW)	Size of 6" deep Rain Garden (sq. ft.) or (LxW)	Size of 12" deep Rain Garden (sq. ft.) or (LxW)
500 sq. ft.	100 sq. ft. or 10'x10'	50 sq. ft. or 10'x5'
750 sq. ft.	150 sq. ft. or 15'x10'	75 sq. ft. or 10'x7½'
1,000 sq. ft.	200 sq. ft. or 20'x10'	100 sq. ft. or 10'x10'
1,500 sq. ft.	300 sq. ft. or 30'x10'	150 sq. ft. or 15'x10'
2,000 sq. ft.	400 sq. ft. or 20'x20'	200 sq. ft. or 20'x10'

Determine Slope

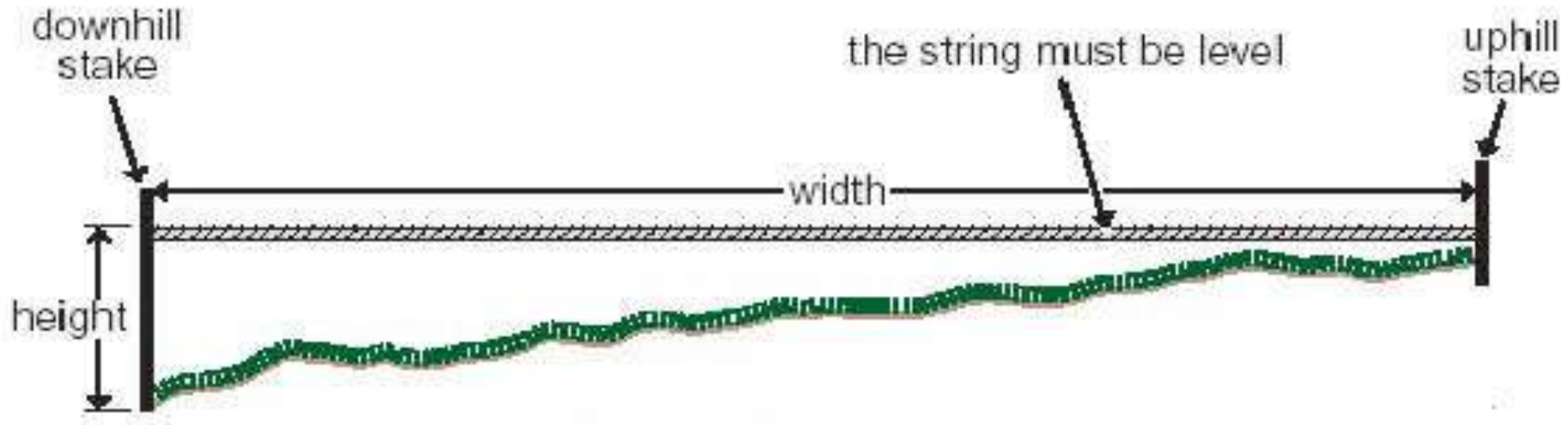


Figure 3 The string should be tied to the base of the uphill stake, then tied to the downhill stake at the same level.

$$\text{Slope} = \frac{H1 - H2}{L} \times 100 = \frac{9'' - 3''}{10'} = \frac{0.75' - 0.25'}{10'} \times 100 = 5\% \text{ slope}$$

Determine Slope

The depth of your rain garden depends upon the slope of your lawn.

Slope	Rain Garden Depth
< 4%	3" – 5"
5% – 7%	6" – 7"
8% – 12%	8"
> 12%	Consider Another Location

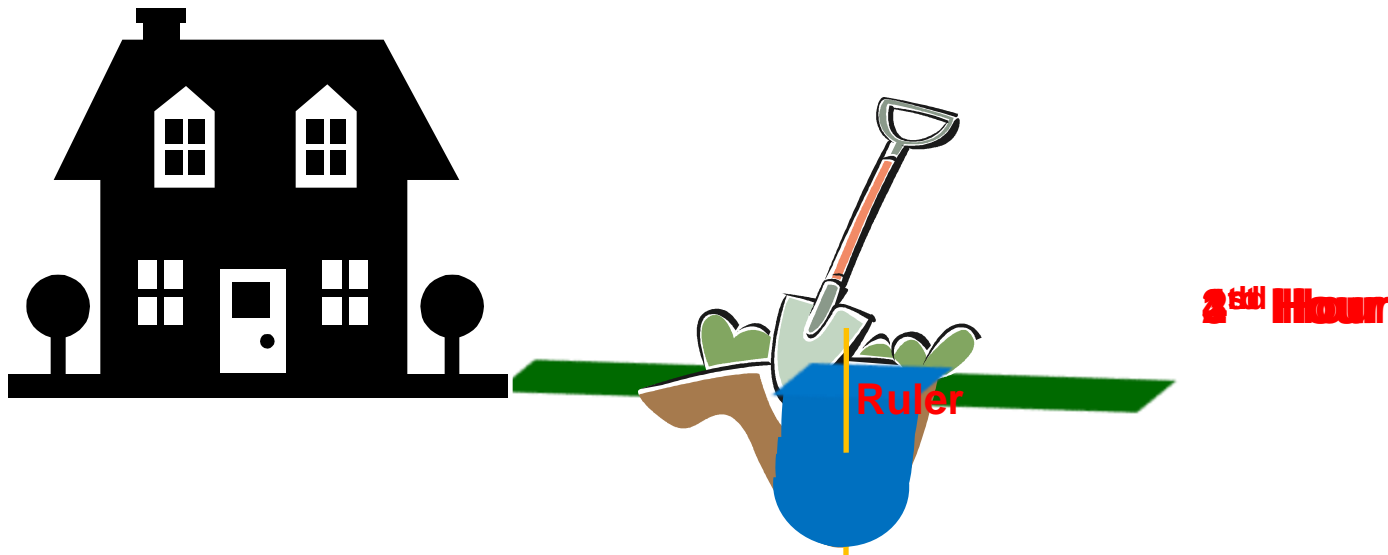
Percolation Test

Steps:

1. Dig a hole 12 inches deep by 6 inches in diameter.
2. Fill hole with water and let stand until all the water has drained into the ground.
3. Refill the empty hole with water again. Measure the depth of water with a ruler.
4. Check the depth of water with a ruler every hour for 4 hours.
5. Calculate how many inches of water drained per hour.

~1 inch of water draining per hour is good

Percolation Test



***Water should be completely
drained within 24 hours.***

Soil Test

- Sample the soil and send to the Rutgers Soil Testing Lab for:
 - Nutrient analysis/ recommendations
 - pH analysis/ recommendations
 - Percent sand/ silt/ clay

- Soil Texture Test

Roll soil into a ball in hand and see how it forms

- Hard ball – Clay/Silt soil
- Soft ball – Loamy soil
- No ball – Sandy soil

Loamy soil is the BEST soil for a rain garden



Gloucester County 4-H Fairgrounds

But, don't worry – clay/silt and sandy soils can be amended to get the preferred loamy soil texture

Take Photographs

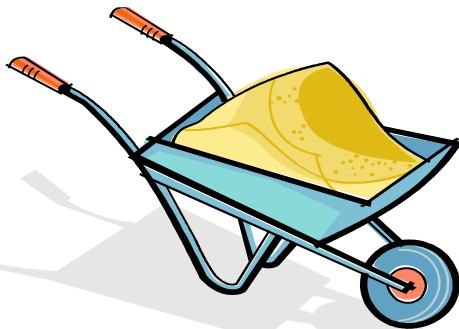


Burlington County Community Agricultural Center

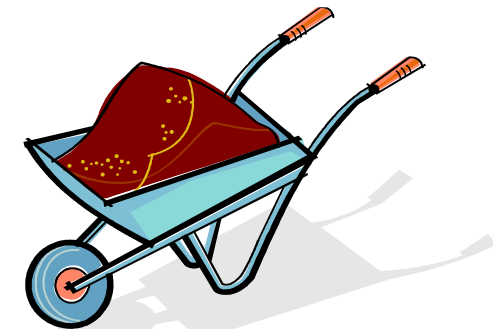


General Soil Amendments Amounts for a 100 sq ft Rain Garden that is 6 Inches Deep

Soil Amendment	Amount for 100 sq ft Rain Garden
Sand	1 cubic yard
Compost	1 cubic yard
Fertilizer	Follow Soil Test Result Recommendations
Lime	Follow Soil Test Result Recommendations



Gloucester County 4-H Fairgrounds



Approximate Amount of Plants Based on Future Mature Size

Size of Rain Garden	Approximate Amount of Plants
100 square feet	1 Small Tree (Optional) 7 Shrubs 24 Herbaceous Species
200 square feet	1 Small Tree (Optional) 14 Shrubs 48 Herbaceous Species



Leonard Park, Morris County

<http://plants.usda.gov>

Types of Plants

Your Rain Garden is composed of woody plants (trees and shrubs) and herbaceous species (flowers, grasses, and ground covers) planted in three wetness zones.

Obligate Wetland (OBL),
Facultative Wetland (FACW)

The lowest zone supports plant species that can tolerate standing water and fluctuating water levels.

**Lowest Zone/
Ponding Area**



Facultative Upland (FACU),
Upland (UPL)

The outer edge or highest zone generally contains plant species that prefer drier conditions.

**Highest Zone/
Upland Area**

**Middle Zone/
Depression Area**

Facultative Wetland (FACW),
Facultative (FAC),
Facultative Upland (FACU)

The middle zone is slightly drier, but also supports plant species that can tolerate fluctuating water levels.

Amount of Mulch Required for a Three Inch Thick Layer

Size of Rain Garden	Approximate Amount of Mulch
25 square feet	0.25 cubic yard
50 square feet	0.50 cubic yard
100 square feet	1.0 cubic yard
200 square feet	2.0 cubic yards

(triple-shredded hardwood)

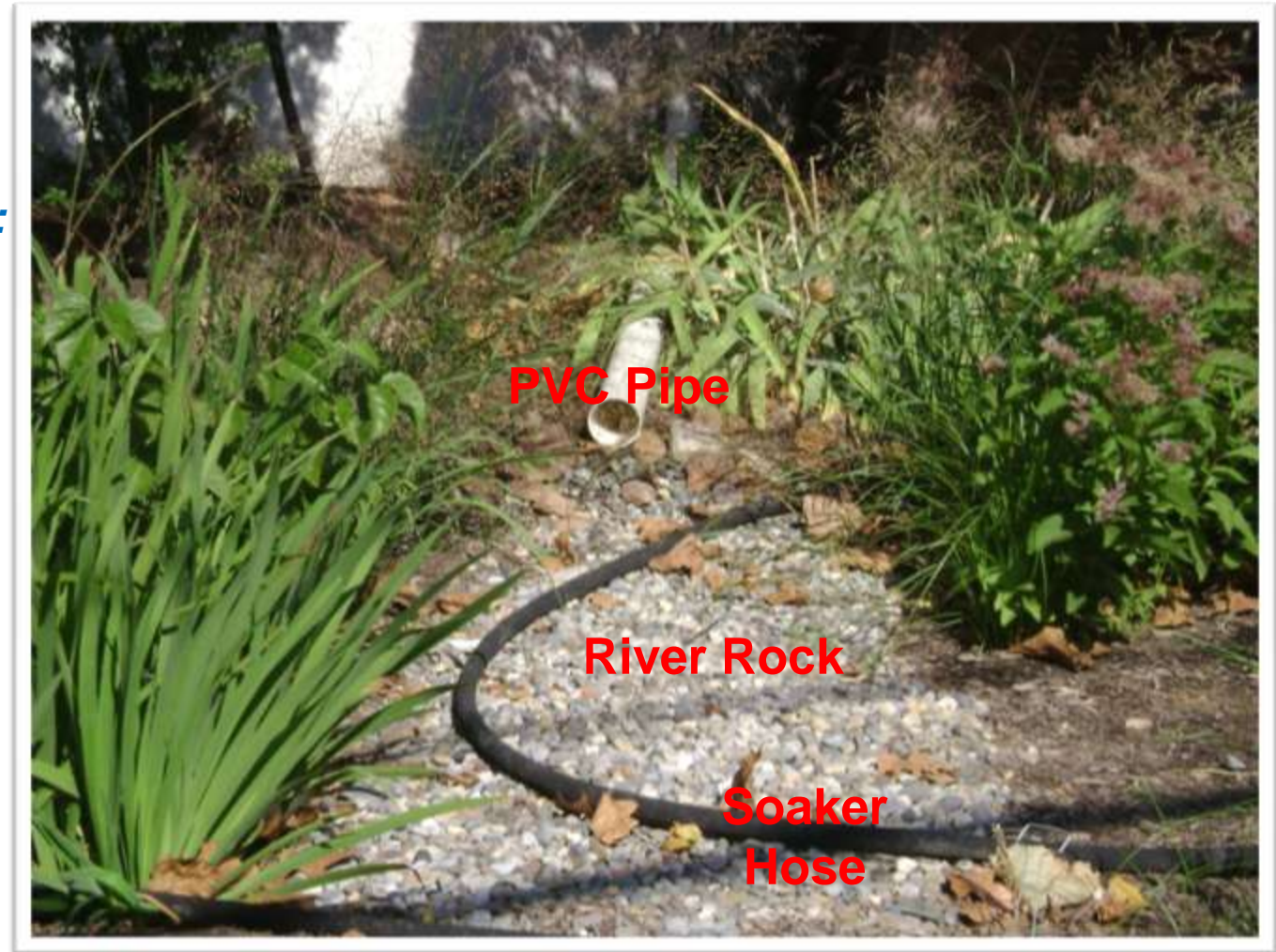


Springfield Municipal Annex Building, Union County

Optional Supplies

Supplies may include:

- River rock
- PVC pipe
- Deer fencing



- Remove existing grass
- Excavate to the desired elevation and grade
- Add soil amendments
- Prepare the berm

2. Installation



- Prepare the overflow
- Level the lowest zone/ponding area
- Plant the native plants
- Apply the mulch
- Water the native plants



Remove Existing Grass



Gloucester County 4-H Fairgrounds

Excavate to the Desired Elevation and Grade



Leonard Park, Morris County



Gloucester County 4-H Fairgrounds

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Installation Steps



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Soil Conservation District



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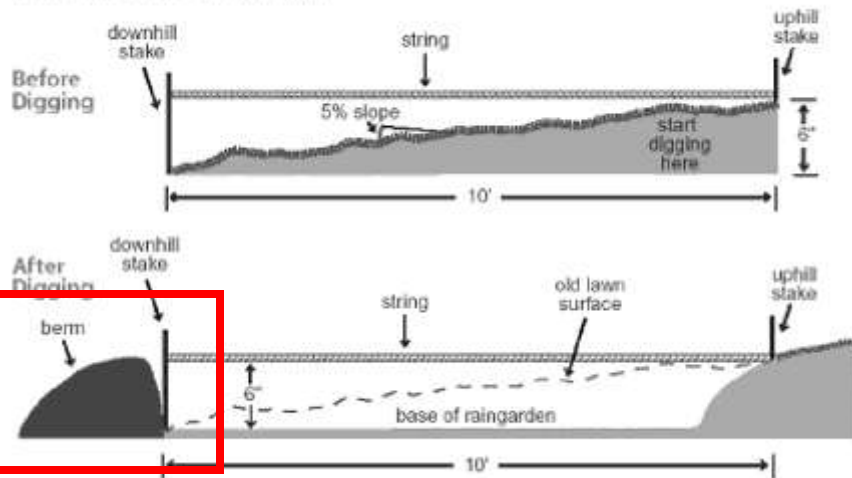
Add Soil Amendments



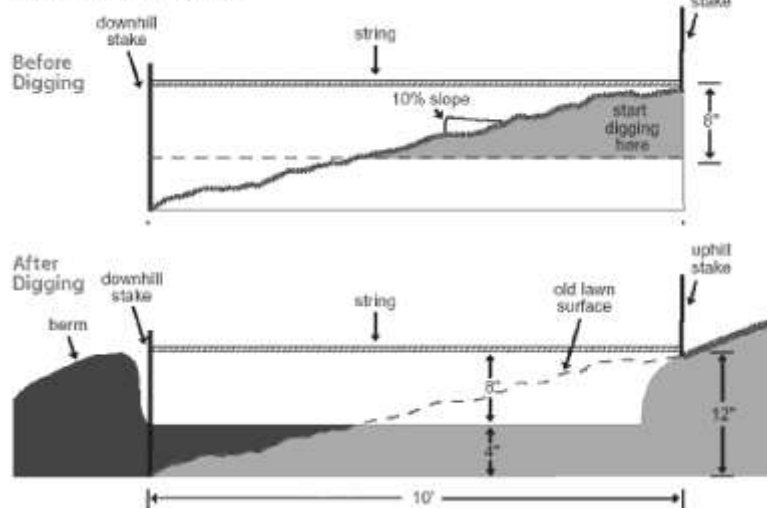
Gloucester County 4-H Fairgrounds

Prepare the Berm

a. Between 3% and 8% slope lawn



b. Greater than 8% slope lawn



Leonard Park, Morris County

Prepare the Overflow



Gloucester County 4-H Fairgrounds



Leonard Park, Morris County

Level the Lowest Zone/ Ponding Area



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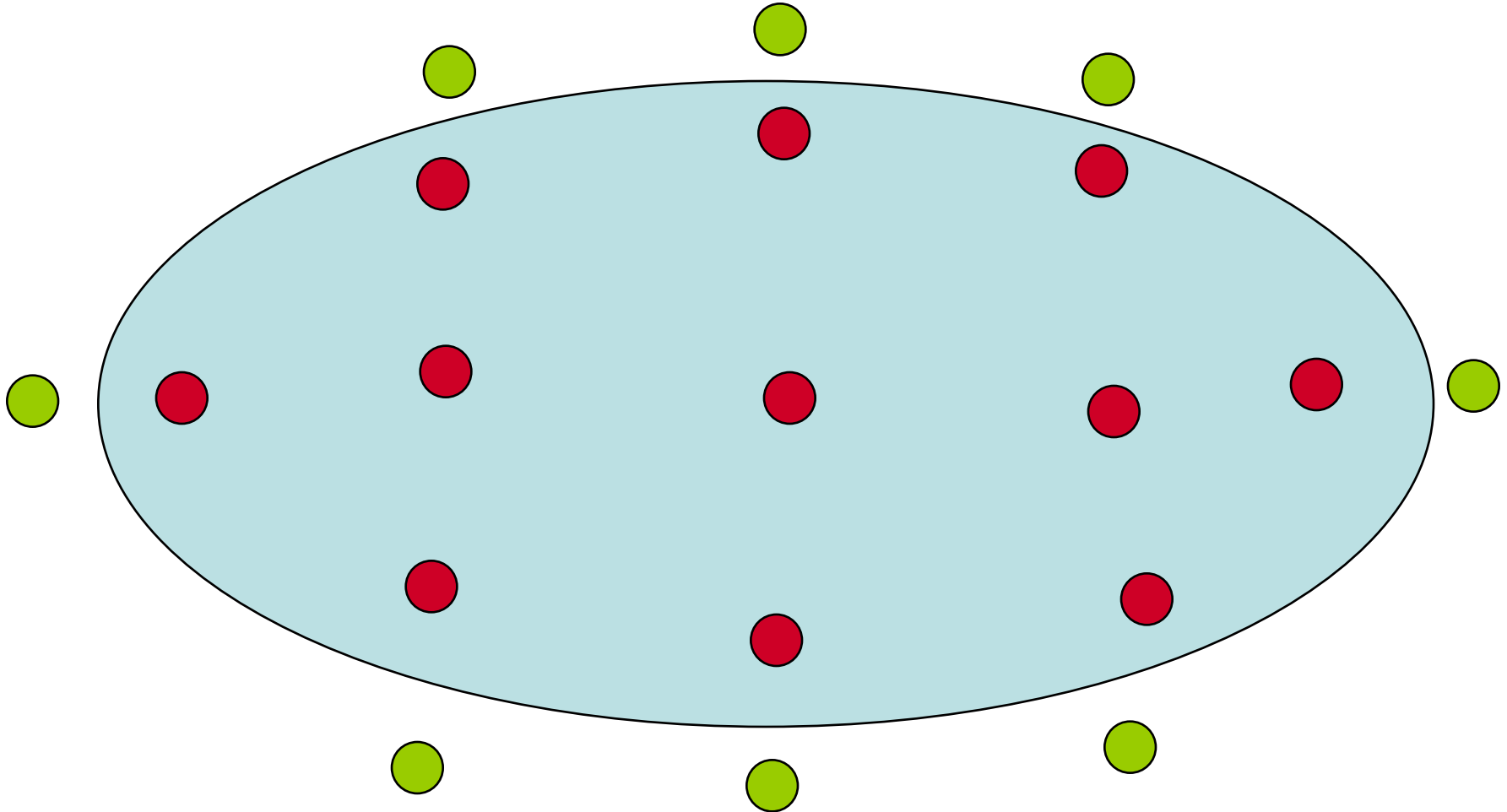
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Plant the Native Plants



Cut the Root Ball



Ulster County, New York

Plant the Native Plants



Ulster County, New York



Hockman Farm, Winchester, Virginia

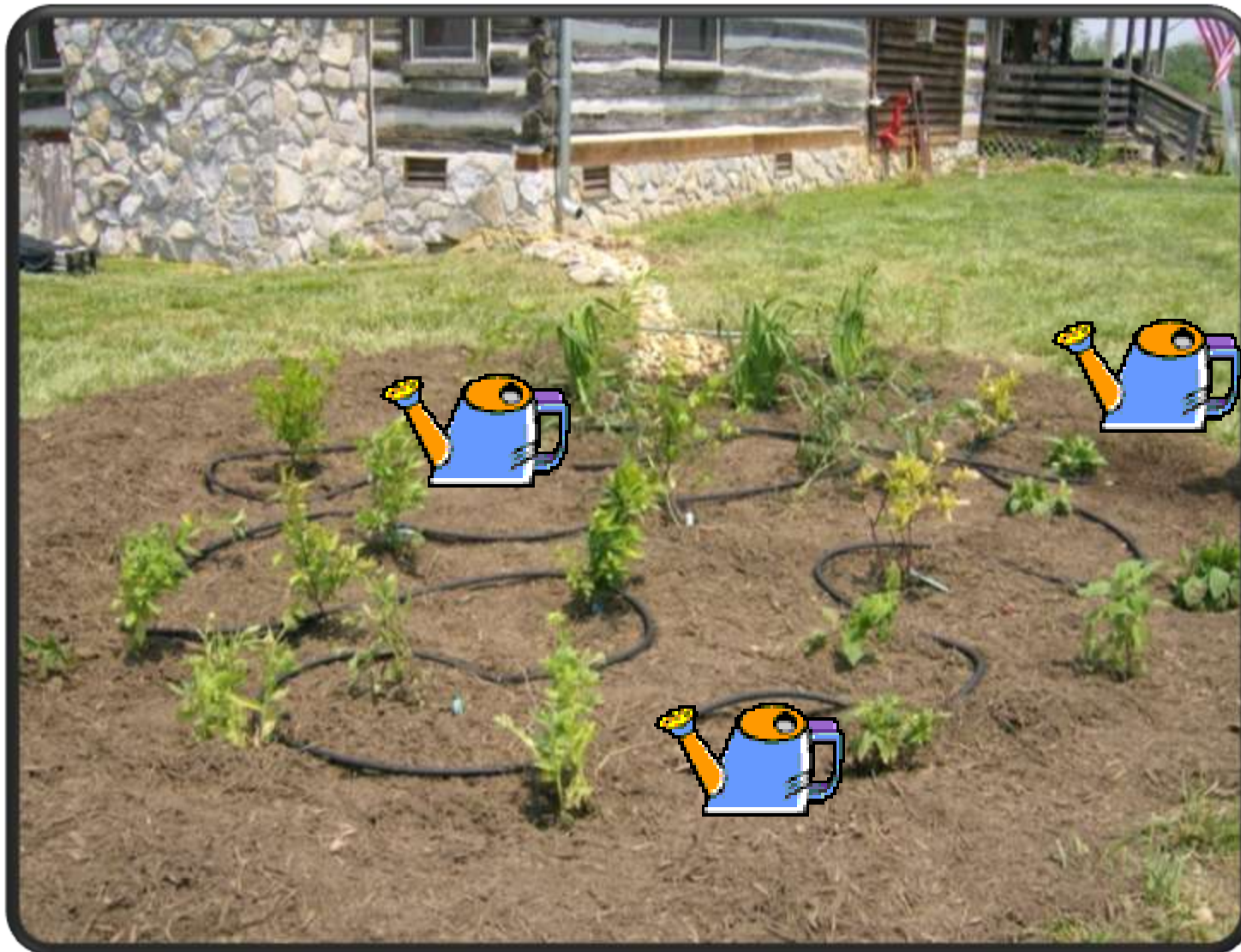
Apply the Mulch

**Protect Small Plants
when Mulching**



*Ulster County,
New York*

Water the Native Plants



Hockman Farm, Winchester, Virginia

Short-Term Maintenance

Long-Term Maintenance

3. Maintenance



Watering



Hanson House/Hanson Park Conservancy, Union County

Weeding

- Weeding more often will limit the amount of time you will have to spend weeding in the end
- Watch for overly-competitive species
- Some weeds can be aggressively spreading underground by rhizomes



Fertilizing

Fertilize at the very beginning or end of the growing season based on soil test results

Soil should be tested every 3 years

- Soil Test Kits can be purchased at the your county Rutgers Cooperative Extension office for a nominal fee

Soil amendments should ONLY be added when NO storms are expected



<http://njaes.rutgers.edu/soiltestinglab>



Observing the Rain Garden

Observe the rain garden during rain events and note any **problems** or **successes**



Walnut Avenue Elementary School, Union County

Problem: Gullying after rain event

Solution: Add a berm and/or plants



Hanson House/Hanson Park Conservancy, Union County

Success: Withstood rain event

Replacing Mulch that has Washed Away



Caring for Native Plants

Care for any newly-planted native plants that may have been uprooted immediately following rain events



Uprooted Plants



Weeding

**Watch for
Invasive Species!**

Invasive Species



Wisteria



Japanese Knotweed



Thistle



Wild Cucumber

Pruning

Pruning directs growth of plants, improves health, and increases production of flowers and fruits.



Types of Pruning:

THINNING: basically, thinning out. This type of pruning removes entire branches back to the main trunk or major branches to the ground.

- ***Expected result:*** large, open shrub

HEADING: also known as heading back. This type of pruning removes only part of a branch

- ***Expected result:*** growth of multiple branches in place of single branch, thus a more ***dense shrub***

***In a rain garden,
dense shrub growth
is encouraged to
provide increased
filtering capacity***

Removing Debris, Litter, and Sediment

Debris



Litter



Sediment



Cutting Down/Mowing the Rain Garden

- Mowing **native grasses** should occur 2 times a year in your rain garden.
 - Initial mowing can be done after the first few weeks of growth – *early Spring*
 - Final mowing can be completed after ground nesting birds have hatched the next generation – *usually near mid-May*
- After the growing season, it will be necessary to remove stems and seedheads. These can be left for habitat and in some areas, aesthetics.
- A string trimmer can be used to maintain over-competitive growths.
- Dead plant materials can also be removed by a string trimmer or mower, if the mowing deck can be raised to cut at 6"-8".



Removing/Replacing Plants

Remove and replace plants that have not survived or that are diseased

- Re-seed the berm if there are areas of exposed soil
- Replace rocks that may be diverting flow out of the garden
- Build up areas where more protection is needed

Build Up Areas



Before
After

Re-seed the Berm



Replace Rocks



Harvest Cuttings

- Collect seeds and cuttings from successful plants in the rain garden and use them for the new season
- Plant more of the successful species in the rain garden as necessary



Apply New Mulch



Walnut Avenue School, Union County

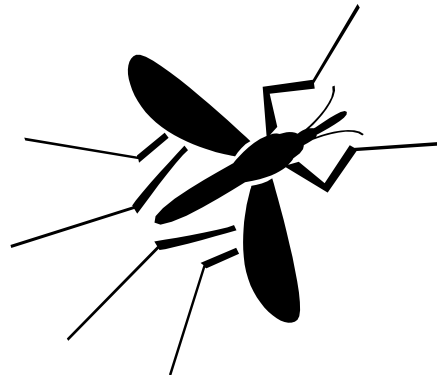
Frequently Asked Questions

- *Will my rain garden cause a mosquito problem?*
- *Will my rain garden cause flooding?*
- *What about deer?*
- *How do I slow down the speed of water as it enters the garden?*



Will my rain garden cause a mosquito problem?

- There shouldn't be a mosquito problem if the garden is properly sited and designed. Rain gardens should drain in less than two days.
- Mosquitoes have a 10 day life cycle from egg to adult.
- Mosquitoes that carry most diseases do not live in ponds. They prefer small amounts of standing water such as holes in trees, old tires or bird baths.



Will my rain garden cause flooding?

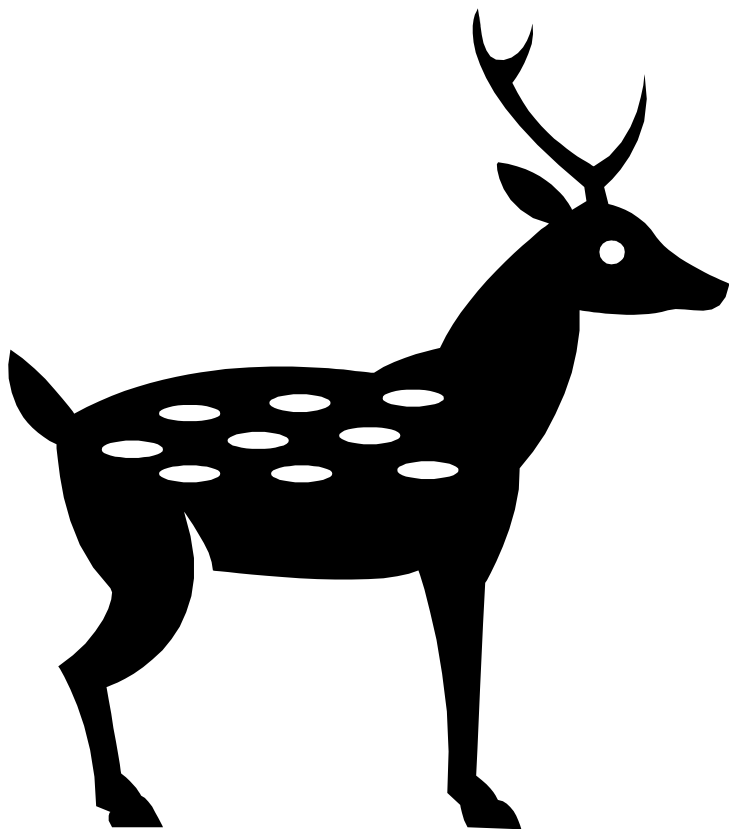
If your rain garden does not drain out the water after ~24 hours, it is time to re-evaluate your rain garden. Maybe try:

- Building berms and/or adding plants
- Adding COARSE sand (not sandbox sand) with organic mulch to the rain garden to help infiltrate the water



What about deer?

Try fencing, deer resistant plants, or deer retardant sprays.



New Jersey Highlands Council Building, Morris County

How do I slow down the speed of water as it enters the garden?

Try one or more of the following:

- (1) Attach a perforated plastic diffuser to the end of your gutter/ downspout
- (2) Use river rock at the entrance point of the rain garden
- (3) Site your rain garden within a 10 – 15 foot grass buffer between the garden and the gutter/downspout. Use native grasses and let them grow tall.



- Rain gardens are designed to intercept, treat, and infiltrate stormwater at the source, before it becomes runoff.
- The plants are native to the region and help retain contaminants that could otherwise harm nearby waterways.
- Rain gardens are beautiful, inexpensive and low-maintenance gardens that you can easily install at home.



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Any Questions?



Essex County Environmental Center, Essex County

<http://water.rutgers.edu>

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Future Site of Rain Garden



Gloucester County Dream Park, Logan Twp.