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## Rain Garden Design (Rooftop and Driveway/ Parking Lot)



## Rain Garden Design Checklist

$\checkmark$ Determine drainage area (rooftop or driveway/ parking lot)
$\checkmark \quad$ Measure drainage area
$\checkmark \quad$ Measure percent slope
$\checkmark$ Correspond percent slope to rain garden depth
$\checkmark$ Correspond drainage area to rain garden size using New Jersey's Water Quality Design Storm (1.25" rain over 2 hours)
$\checkmark$ Analyze soil (soil texture, percolation test, soil compaction)
$\checkmark$ Determine soil amendments, if necessary
$\checkmark$ Determine rain garden inlet
$\checkmark$ Determine erosion potential
$\checkmark \quad$ Determine rain garden overflow
$\checkmark \quad$ Determine mulch quantity
$\checkmark$ Determine plant quantity
$\checkmark$ Summarize rain garden design

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## Determine Drainage Area \& Measure Drainage Area

Rooftop Scenario


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Determine Drainage Area \& Measure Drainage Area

## Driveway/ Parking Lot Scenarios



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Determine Drainage Area \& Measure Drainage Area

Area of Square/Rectangle $=$ Length $\mathbf{x}$ Width


Area of Triangle $=($ Base $\times$ Height $) / 2$


$$
\begin{aligned}
\text { Area } & =\left(20^{\prime} \times 12^{\prime}\right) / 2 \\
& =\left(240 \mathrm{ft}^{2}\right) / 2 \\
& =120 \mathrm{ft}^{2}
\end{aligned}
$$

Base $=20^{\prime}$

Measure Percent 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.

## $\frac{\text { Height }}{\text { Width }} \times 100=\%$ Slope

Correspond Percent Slope to Rain Garden Depth

| Percent Slope | Typical Depth |
| :---: | :---: |
| $\leq 4 \%$ | $3 "-5 "$ |
| $5 \%-7 \%$ | $6 "-7 "$ |
| $8 \%-12 \%$ | $8 "$ maximum depth |
| $>12 \%$ | Consider another <br> location |

Exception: Sites with poor percolation or high percentage of clay soils will be shallower with a larger surface area since they percolate slowly (see Tips for Rain Gardens in Clay Soils worksheet)

| Rain Garden Sizing Table <br> Based on New Jersey's Water Quality Design Storm |  |  |  |
| :---: | :---: | :---: | :---: |
| Drainage Area | Size of 3" Deep Rain Garden | Size of 6" Deep Rain Garden | Size of 8" Deep Rain Garden |
| $500 \mathrm{ft}^{2}$ | $200 \mathrm{ft}^{2}$ | $100 \mathrm{ft}^{2}$ | $75 \mathrm{ft}^{2}$ |
| $750 \mathrm{ft}^{2}$ | $300 \mathrm{ft}^{2}$ | $150 \mathrm{ft}^{2}$ | $112 \mathrm{ft}^{2}$ |
| $1000 \mathrm{ft}^{2}$ | $400 \mathrm{ft}^{2}$ | $200 \mathrm{ft}^{2}$ | $149 \mathrm{ft}^{2}$ |
| $1500 \mathrm{ft}^{2}$ | $600 \mathrm{ft}^{2}$ | $300 \mathrm{ft}^{2}$ | $224 \mathrm{ft}^{2}$ |
| $2000 \mathrm{ft}^{2}$ | $800 \mathrm{ft}^{2}$ | $400 \mathrm{ft}^{2}$ | 299 ft ${ }^{2}$ |

## Correspond Drainage Area to Rain Garden Size using NJ's Water Quality Design Storm

## How did we do this?

[Drainage Area (square feet) x NJ's Water Quality Design Storm (feet)] [Depth (feet)]

Size of = Rain Garden (square feet)

## Rooftop Example:



Rooftop \#1:
Length = 10'

Width = 20'
Drainage Area $=$ Length $\times$ Width

$$
=10^{\prime} \times 20^{\prime}
$$

$$
=200 \mathrm{ft}^{2}
$$

Rooftop \#2:
Length = 10'
Width = 10'
Drainage Area $=$ Length $\times$ Width

$$
\begin{aligned}
& =10^{\prime} \times 10^{\prime} \\
& =100 \mathrm{ft}^{2}
\end{aligned}
$$

Total Drainage Area = DA of Rooftop \#1 + DA of Rooftop \#2

$$
\begin{aligned}
& =200 \mathrm{ft}^{2}+100 \mathrm{ft}^{2} \\
& =300 \mathrm{ft}^{2}
\end{aligned}
$$

$\xrightarrow{\left[300 \mathrm{ft}^{2} \times 0.1^{\prime}\right]}=60 \mathrm{ft}^{2}$ rain garden $6 "$ deep

## CHEAT SHEET

 $\checkmark$ NJ's Water Quality Design Storm = 1.25" $=0.1^{\prime}$$\checkmark 3^{\prime \prime}=0.25^{\prime}$
$\checkmark 6^{\prime \prime}=0.50^{\prime}$
$\checkmark 8^{\prime \prime}=0.67^{\prime}$
$=200 \mathrm{ft}^{2}+100 \mathrm{ft}^{2}$

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## Correspond Drainage Area to Rain Garden Size using NJ's Water Quality Design Storm

## How did we do this?

[Drainage Area (square feet) x NJ's Water Quality Design Storm (feet)] [Depth (feet)]

Length $=20^{\prime}$
Width = 30'
Drainage Area $=$ Length $\times$ Width
$=20^{\prime} \times 30^{\prime}$
$=600 \mathbf{f t}^{2}$

Size of = Rain Garden (square feet)
Parking Lot Example:


## CHEAT SHEET

 $\checkmark$ NJ's Water QualityDesign Storm $=1.25^{\prime \prime}$
$=0.1^{\prime}$
$\checkmark 3^{\prime \prime}=0.25^{\prime}$
$\checkmark 6^{\prime \prime}=0.50^{\prime}$
$\checkmark 8^{\prime \prime}=0.67^{\prime}$
[ $\left.600 \mathrm{ft}^{2} \times 0.1^{\prime}\right]$ [0.25']
$=240 \mathrm{ft}^{2}$ rain garden 3" deep

- Soil texture

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
- Percolation test
- Soil compaction

Wire Flag Test


Poke wire flag in ground

- Easily penetrates 6-8" or more
- Compacted, difficult to insert


## Optimal sand content for a rain garden is 70\%

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



Determine Rain Garden Overflow

## Where will the excess stormwater runoff go in a heavy storm event?

- Overflow is away from buildings
- Berm higher near building
- Overflow sheets over lawn or garden

- Overflow sheets over driveway or walkway
- Flows onto street - an existing storm drain can be used as an outlet for a rain garden


## How did we determine how much coarse sand to add?

| Class | Texture | Recommended Amendments |  |
| :---: | :---: | :--- | :--- |
| Soil <br> Texture <br> Class | A | Sandy | Compost helpful, but not <br> required |
|  | B | Silt <br> loam/Loam | Add 1"-2" concrete or bank-run <br> sand |
| C | Sandy clay/ <br> Loam | Add 2"-4" concrete or bank-run <br> sand |  |
| D | Clayey | Add 2"-4" concrete or bank-run <br> sand |  |

How many cubic yards of coarse sand to buy
$\times$ (Rain garden surface area in square feet) $=$ Cubic yards

Use sand with a mixture of grain sizes. Do not use mason or ball field sand.

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## Determine Rain Garden Inlet

## How will the stormwater runoff enter the rain garden?

- Extended downspout/gutter
- Stone or concrete spillway
- Across lawn via a gradual slope
- Vegetated or stone-lined swales

- Diversion berm along the bottom of slope
- Paved surface


## Determine Erosion Potential

## Will the velocity and erosion of the stormwater runoff be a problem?

- No
- Yes, erosion is possible. Address with:
- Grading
- Rocks or obstructions to slow flow
- Rocks to stabilize
- Erosion control blanket



## Determine Mulch Quantity

- Triple-shredded hardwood mulch with no dye is used in a rain garden
- Mulch should be maintained at a 3 depth in a rain garden
- The benefits of mulch:
- Keeps soil moist, which allows for percolation of rain water
- Protects plants and makes weeding easier
- Minimizes erosion of the rain
 garden soil


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## Determine Mulch Quantity

## Amount of Mulch Required for a Three Inch Thick Layer

| Size of Rain <br> Garden | Approximate Amount <br> 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 |
| :--- |
| Mulch with No Dye) |



[^0]
## Determine Plant Quantity

Experiment Statior

## Approximate Amount of Plants Based on Future Mature Size

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



Leonard Park, Morris County

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## Summarize Rain Garden Design

- Determine rain garden size and depth, what soil amendments are needed (if necessary), mulch quantity, plant quantity, and other materials (river rock, deer fencing, soaker hose, etc.)
- Use the Rain Garden Site Visit Worksheet (Pre-Installation) for assistance!


[^0]:    Springfield Municipal Annex Building, Union County

