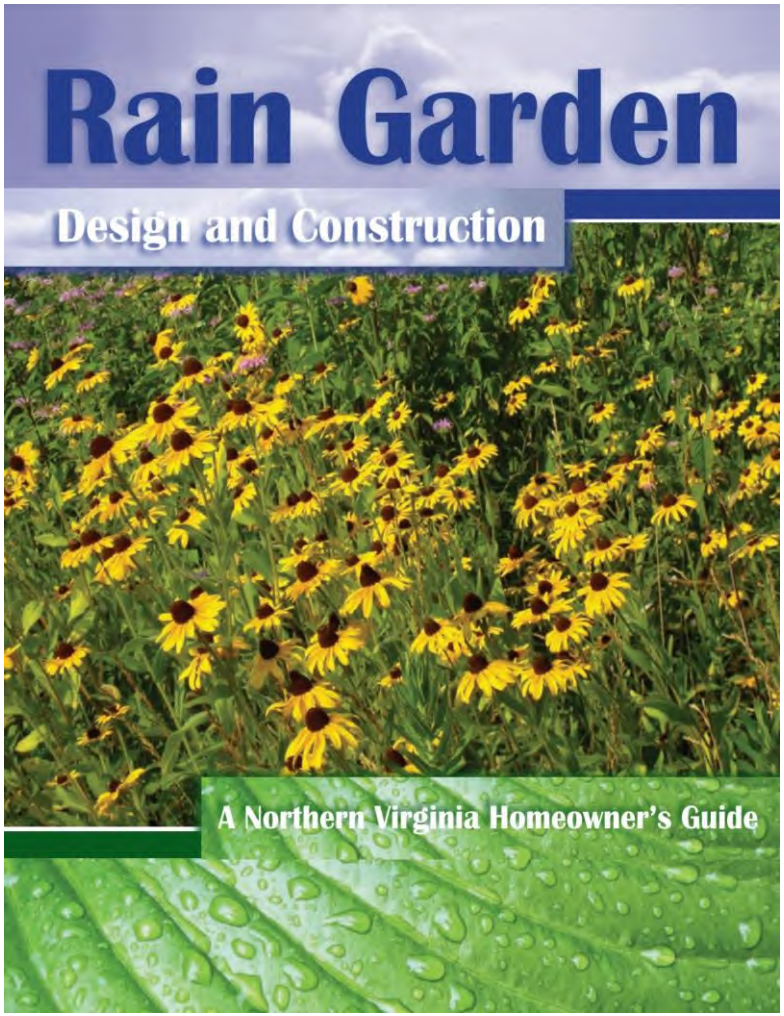
Residential Rain Garden Design & Construction

Northern Virginia Soil and Water Conservation District

NVSWCD Rain Garden Guide



https://www.fairfaxcounty.gov/soil-water-conservation/sites/soil-water-conservation/files/assets/documents/raingardenbk.pdf

A word on Terminology!

1. Bioretention

- Larger in size, often built to comply with SWM regulations
- Deeper
- Under drain
- Often requires permit to build
- Costs more per unit surface area


Bioretention

2. Rain Garden


Rain Garden


Rain Garden

NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT

Do your homework first!

Steps to take before you decide

1. Decide why you want to build a rain garden
2. Decide where you want to place your rain garden
3. Check the location suitability for your rain garden
4. Determine the size of your rain garden
5. Determine what materials and how much you need
6. Select the tools that you are going to need to build your rain garden
7. Estimate the costs

NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT

How can I choose the right location for my rain garden?

NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT

How can I choose the right location for my rain garden?

NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT

How can I choose the right location for my rain garden?

Location tips!

- Ensure that you have enough space for your rain garden
- Ensure that overflow is safely diverted
- Keep close to the source of runoff
- Keep at least 10.0 feet from building foundation
- Avoid building over underground utilities
- Avoid easements

https://fairfaxcountygis.maps.arcgis.com/apps/webappviewer/index.html?id=765724d1e8f04f5b84406266caead1fa

Fairfax County Interactive Map Gallery
"Stormwater Infrastructure Map"

NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT

How can I choose the right location for my rain garden?

Location tips!

- Avoid steep slopes
- Avoid building under big trees
- Avoid building in RPA (Resource Protected Area) or flood plain
- Avoid building close to septic system and drinking water wells
- Avoid low areas with standing water

Where there is standing water is usually not the right location for a rain garden.

NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT

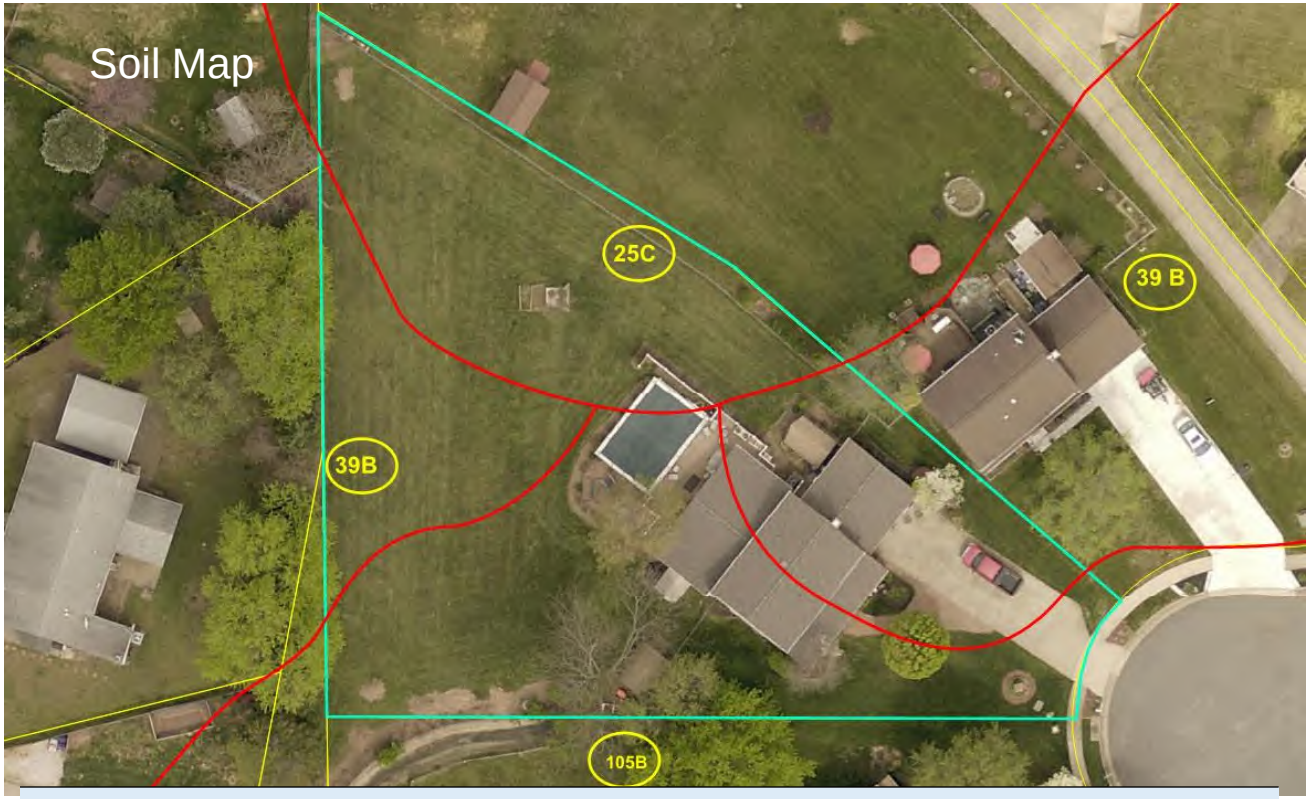
Is the location I have chosen the right location for a rain garden?

A rain garden needs soil that infiltrates

https://www.fairfaxcounty.gov/soil-water-conservation/soils-info

Examples of failed rain gardens

How do I know if the soils on my property have good infiltration?



Soil Number	Soil Name	Suitibility for infiltration
25C	Chantilly-Penn	Poor
39B	Glenelg	Good
105B	Wheaton Glenelg	Good

https://fairfaxcountygis.maps.arcgis.com/apps/webappviewer/index.html?id=ae94d4d5044047e29aa04d44484dde99

Fairfax County Interactive Map Gallery
"Soils Viewer"

How do I know if the soils on my property have good infiltration?

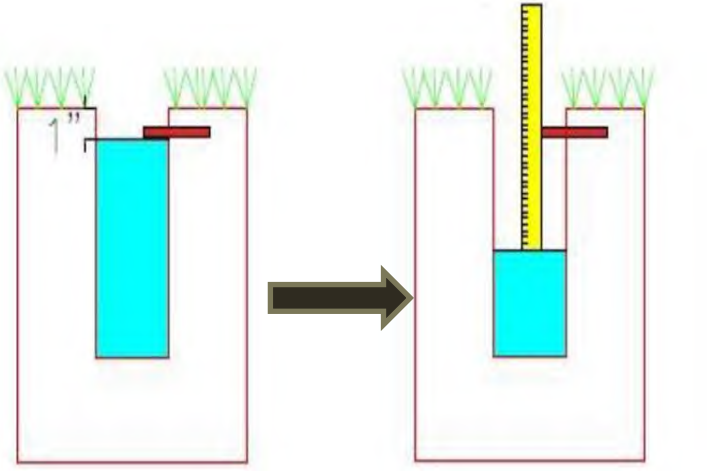
You can measure soil infiltration yourself

https://www.fairfaxcounty.gov/soil-water-conservation/sites/soil-water-conservation/files/assets/documents/vcap-infiltration-test-soil-standards.pdf

NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT

Measuring the Infiltration Rate

- **Infiltration Test**
  - **Measures the capacity of the soil to soak up water.**



Time (hours)	Measurement, m (inches)	Drop, d (inches)	Infiltration Rate, i (inches/hour)
0	5.125	--------	----------
		--	-
1	9.125	4	4
2	12.25	3.125	3.1
3	16.5	4.25	4.3
4	20.25	3.75	3.8
		Avg. Rate	3.8

NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT

Results: What Do They Mean?

Infiltration Results

- **Rain gardens:**
- Rates >0.5 in/hr: Only compost amendments to the native soil are required.
- Rates between 0.5 and 0.25 in/hr: Native soil must be excavated and replaced with engineered rain garden soil.
- Rates <0.25 in/hr: Native soil must be excavated and replaced with engineered rain garden soil **and** underdrain must be installed. Also use professional judgement to determine if rain garden is suitable at this location.

NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT

Determine the size of your rain garden

NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT

Do I really need to size my rain garden?

1. Definition
2. Useful to know how to size your rain garden
3. Various ways to size
    1. Alliance for the Chesapeake Bay Yard Design Tool
    2. http://www.stormwater.allianceforthebay.org/yard-design

How do I size my rain garden?

1. Determine the impervious area that will be captured by your rain garden
2. Determine the volume of runoff to be captured by the rain garden
3. Decide on the ponding depth on top of your rain garden
4. Size your rain garden

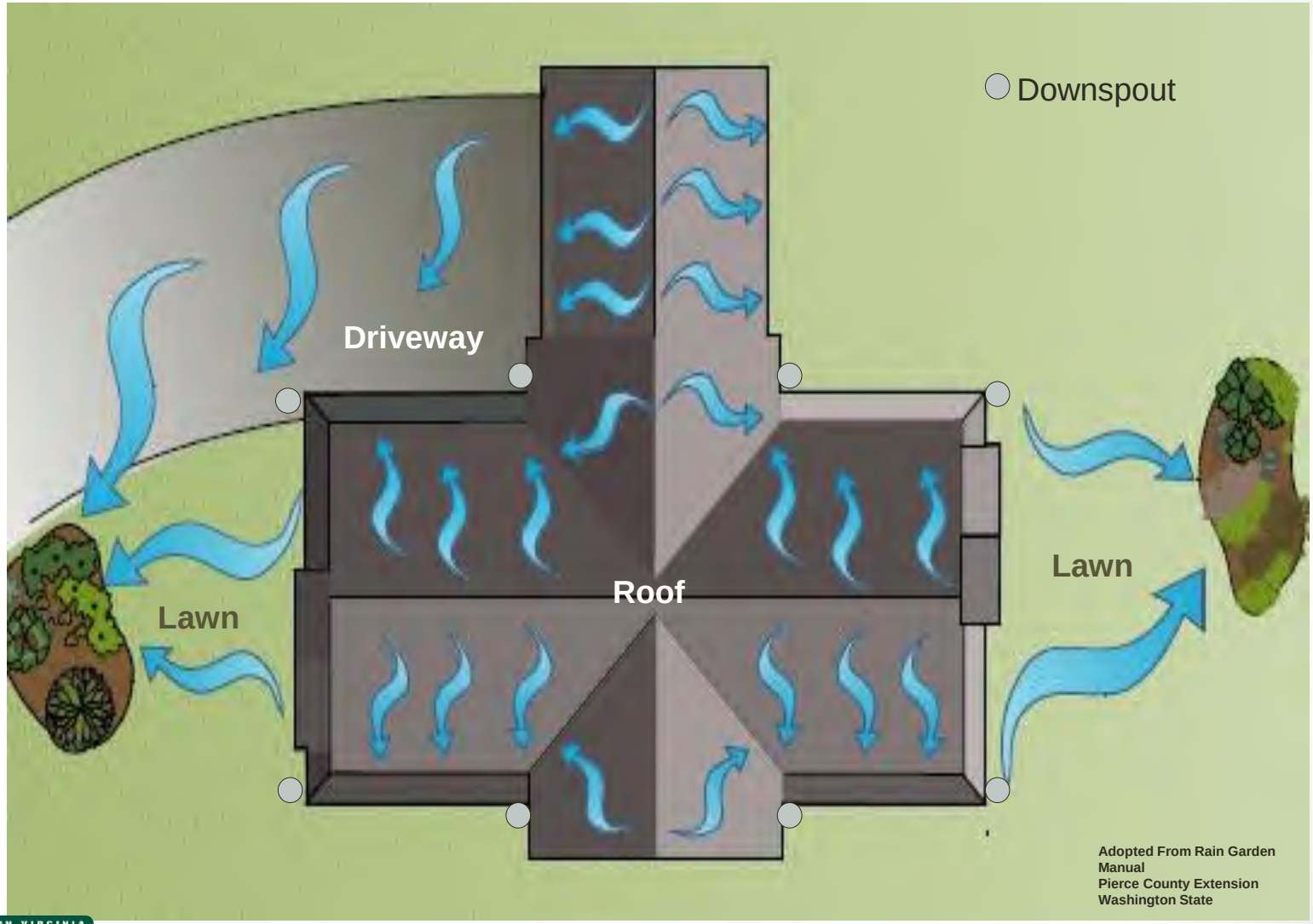
NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT

How do I size my rain garden?

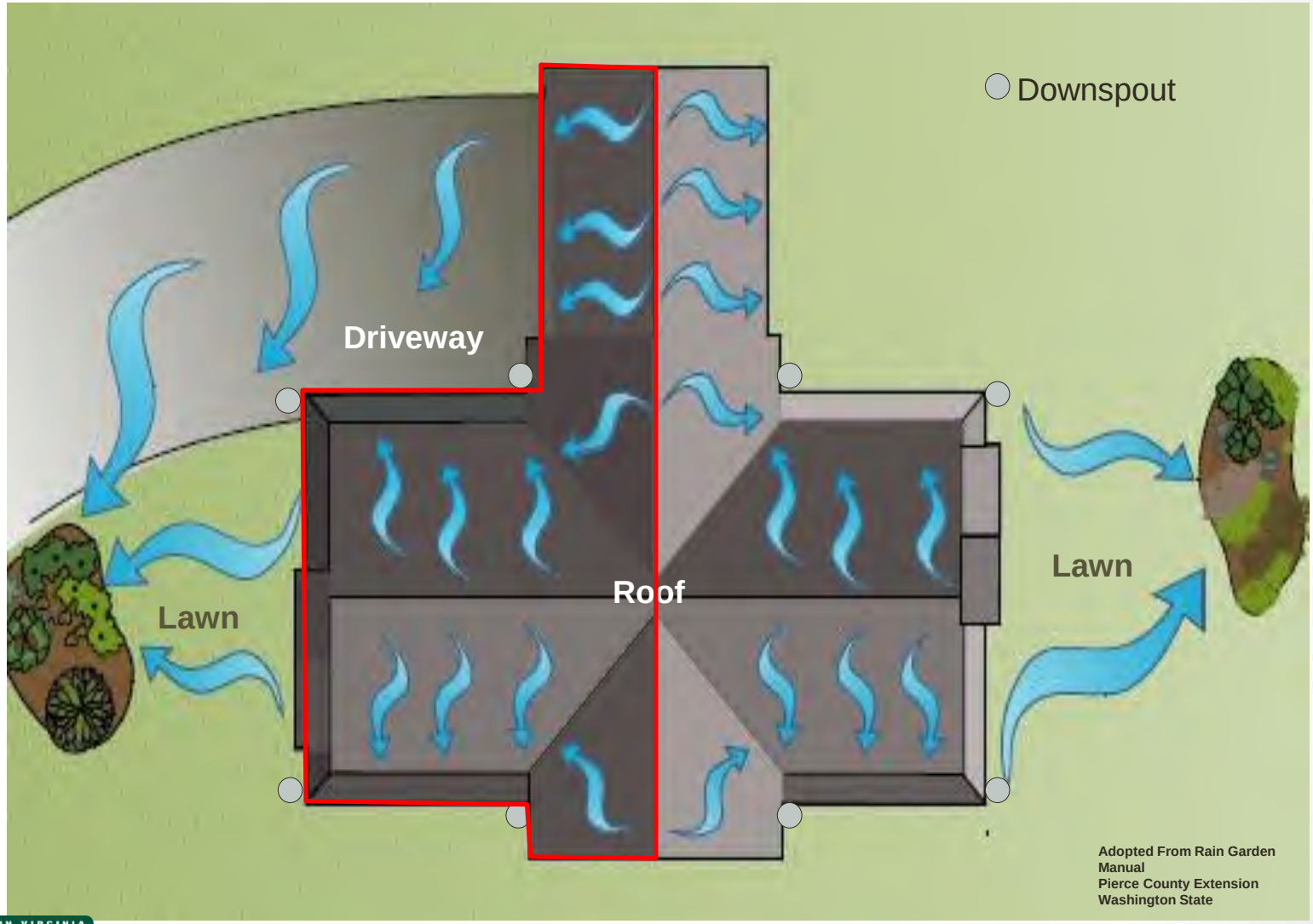
Adopted From Rain Garden Manual
Pierce County Extension
Washington State

NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT

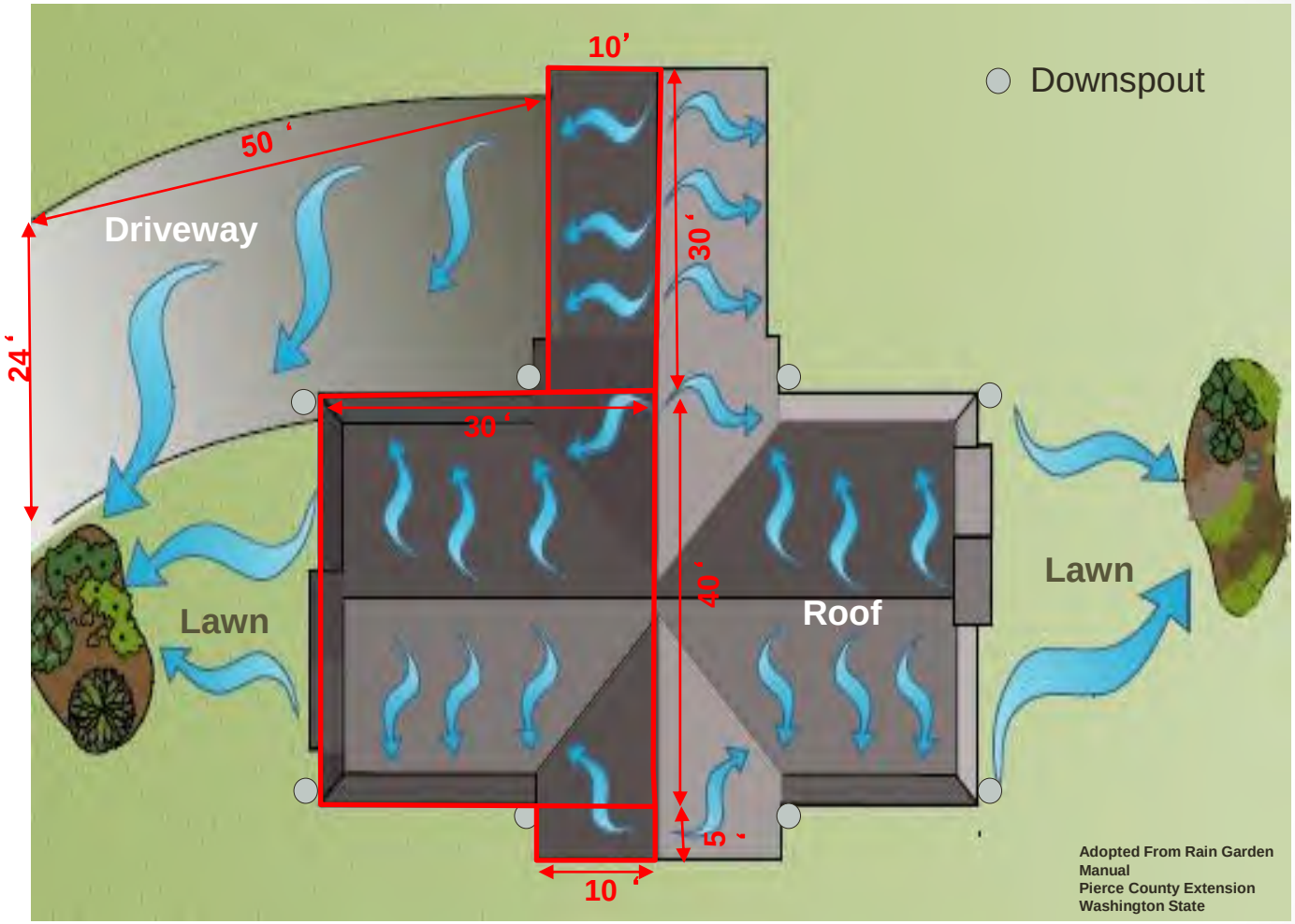
How do I size my rain garden?



Calculate the impervious area

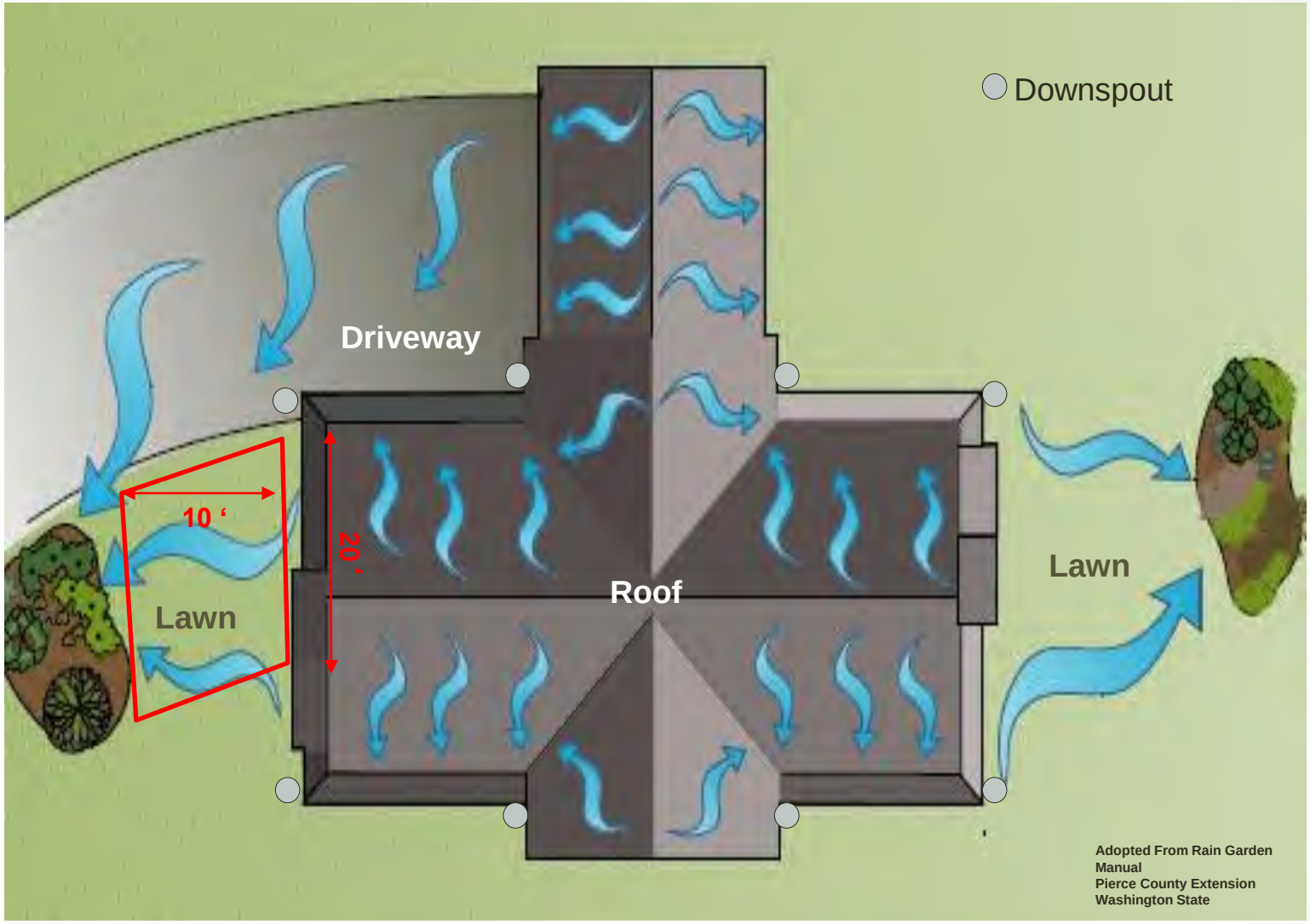


Calculate the impervious area



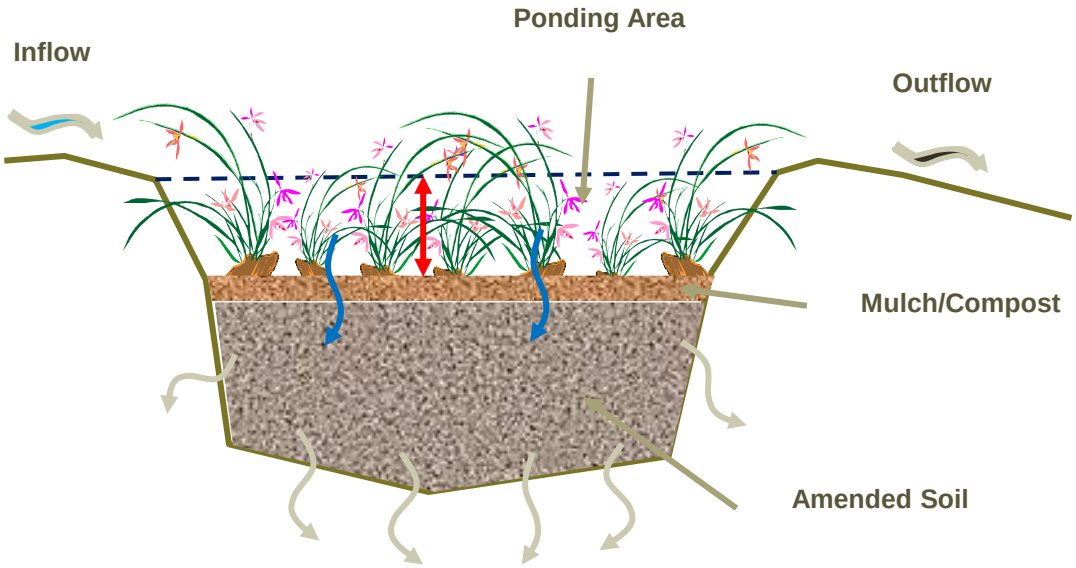
Driveway = 1200 square feet
Roofs = 300 + 1200 + 50 = 1550 square feet
Total impervious area = 2750 square feet
Runoff volume = Total impervious area x rainfall = (Total impervious area x 0.08)

Calculate the pervious area



Lawn = 200 square feet
Total impervious area = 200 square feet
Runoff volume = Total pervious area x rainfall = (Total pervious area x 0.02)

Determine ponding depth for your rain garden



Size your rain garden

Surface area = (impervious area x 0.08) / (ponding depth)

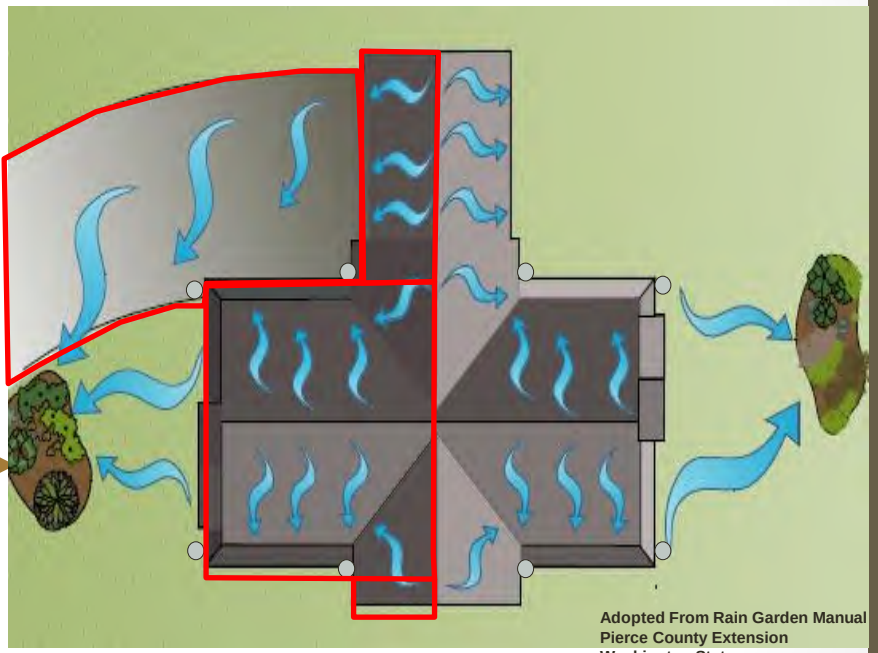
Surface area = (pervious area x 0.02) / (ponding depth)

Impervious area: 2,750 square feet
Ponding depth: 1.0 foot
Rainfall 1.0 inch = 0.08 foot

Surface area:
(2,750 x 0.08)/(1) = 220 square feet

Surface area:
(200 x 0.02)/(1) = 4 square feet

220 + 4 = 224 square feet



Adopted From Rain Garden Manual
Pierce County Extension
Washington State

Driveway = 1,200 square feet
Roofs = 300 + 1,200 + 50 = 1,550 square feet
Total impervious area = 2,750 square feet
Total pervious area = 200 square feet

Sizing worksheet

A	Total impervious area (square feet) =
B	Rain garden ponding depth (feet) =
C	Rain garden surface area = (A x 0.08) / (B) =
Note: If C is more than 300 square feet, divide the area into two rain gardens.	

Impervious Surface (sq. ft.) x [(0.08)/Dp] = _____ sq. ft.
Pervious Surface (sq. ft.) x [(0.02)/Dp] = _____ sq. ft.
Total Surface Area (Impervious + Pervious) = _____ sq. ft.

NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT

How do I size my rain garden?

Impervious (sf)	Surface area versus ponding depth (ft^2)		
	6.0"	9.0"	12.0"
500	80	33	40
750	120	80	60
1000	160	110	80
1500	240	160	120
2000	320	212	160

Surface Area = (Drainage area x 0.08)/(Ponding depth)

Pervious (sf)	Surface area versus ponding depth (ft^2)		
	6.0"	9.0"	12.0"
500	20	13	10
750	30	20	15
1000	40	27	20
1500	60	40	30
2000	80	53	40

Surface Area = (Drainage area x 0.02)/(Ponding depth)

Make an inventory of what you need to build your rain garden.

You need to know:

1. Your surface area
2. Depth of amended soil

You need to estimate:

1. Rain garden depth
2. Excavation volume
3. Mulch/compost
4. Amended soil
5. Gravel (optional)
6. Plants
7. Pipe (under drain), rocks, cobbles (inflow/outflow)

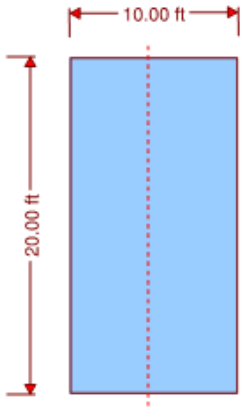
Make an inventory of what you need to build your rain garden.

Decide what tools you need.

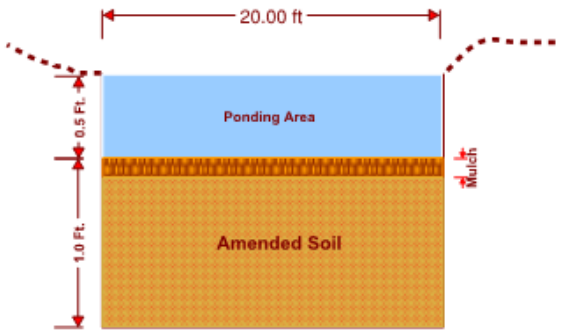
- Measuring tape
- Wood stakes
- Rope or string
- Level
- Paint or builder's chalk
- Shovels and rakes
- Wheelbarrow
- Machinery (if needed), mini excavator

Estimate the costs.

Make an inventory of what you need to build your rain garden.



Plan view



X-Section

Surface area = 10.0 x 20.0 = 200.0 sf
Total depth = 1.5 ft.
Volume = Surface area x depth

Volume estimates:

Excavation vol. = 200.0 x 1.5 = 300.0 cubit ft. = 11.1 Cubic yard
Mulch/compost vol. = 0.25 ft x 200.0 sf = 50.0 cubic ft. = 1.85 cy
Amended soil vol. = 200.0 sf x 1.0 = 200.0 cubic feet = 7.4 cy

Cost estimated:

Hauling excavated soil = 11.1 x $35.0 = $388.5
Amended soil = 7.4 x $80.0 = $592.0
Mulch/compost = 1.85 x $40.0 = $74.0
Mini Excavator = $500.0/day
Plants = depends on type, numbers and size

Gravel = $50.0/cy (optional)
Under drain = variable (if needed)

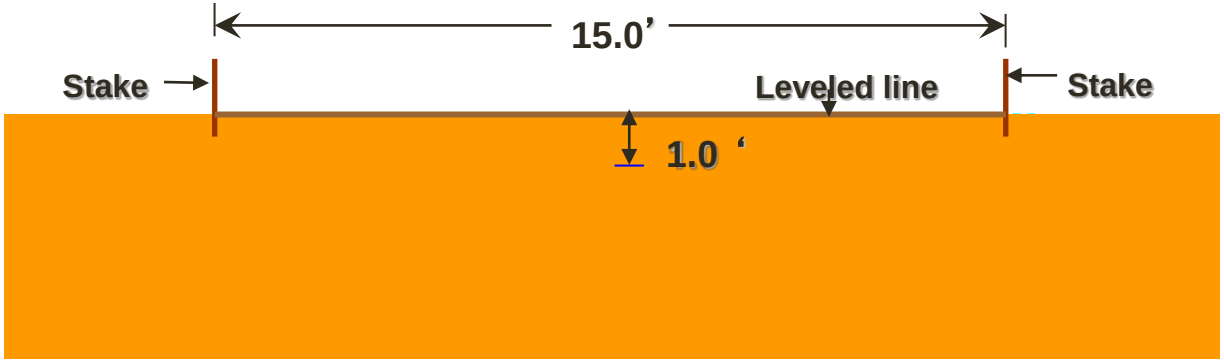
NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT

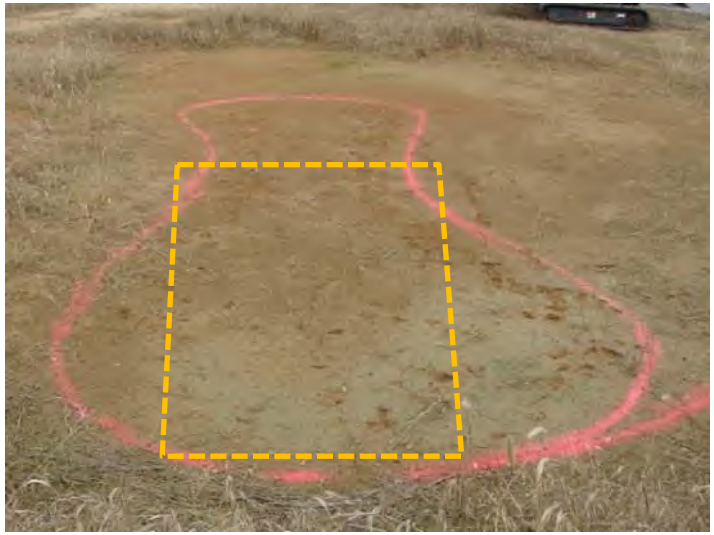
Tips on how to build your rain garden!

Building

NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT

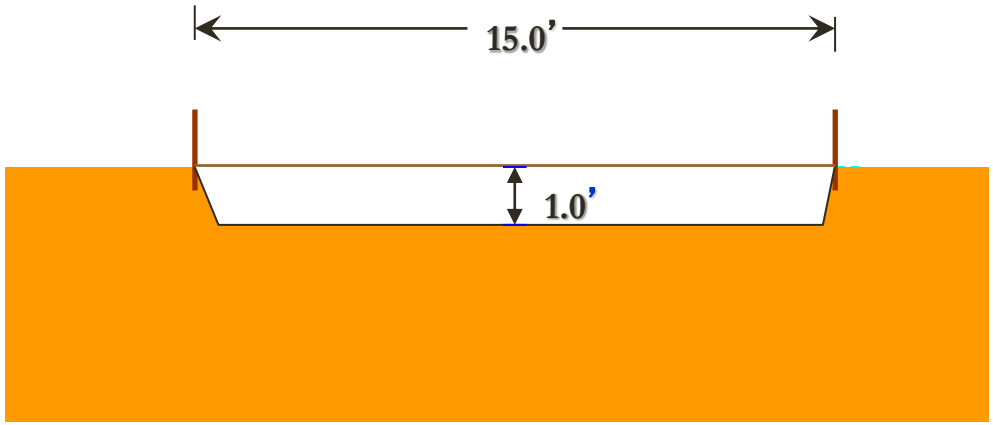
Tips on how to build your rain garden





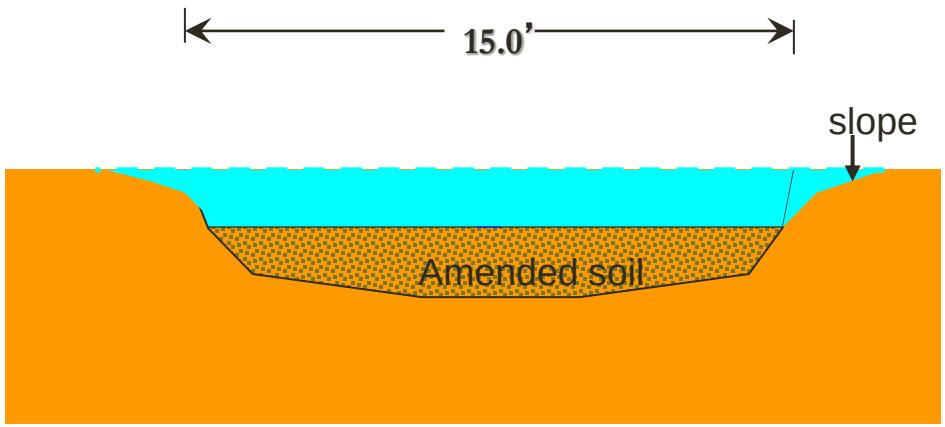
Ground surface is relatively flat.

Tips on how to build your rain garden



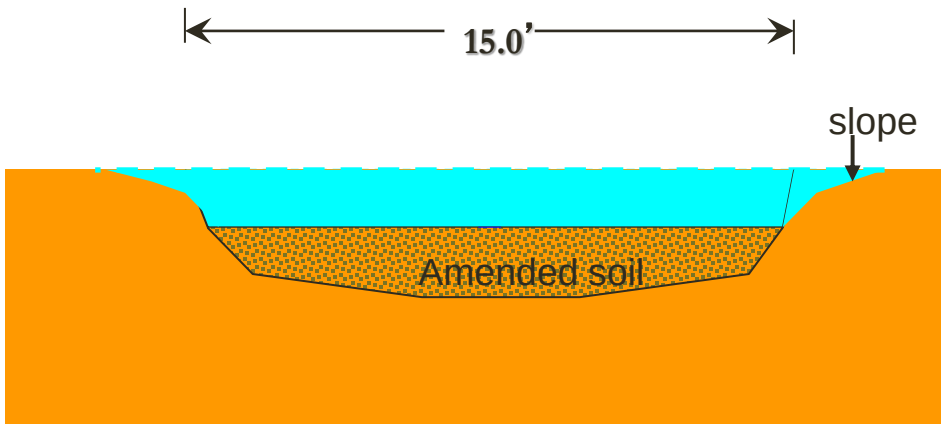
Ground surface is relatively flat.

Tips on how to build your rain garden



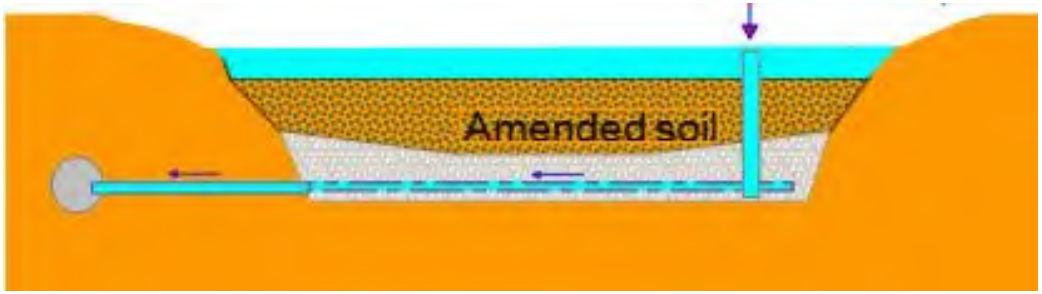
Ground surface is relatively flat.

Tips on how to build your rain garden



Ground surface is relatively flat.

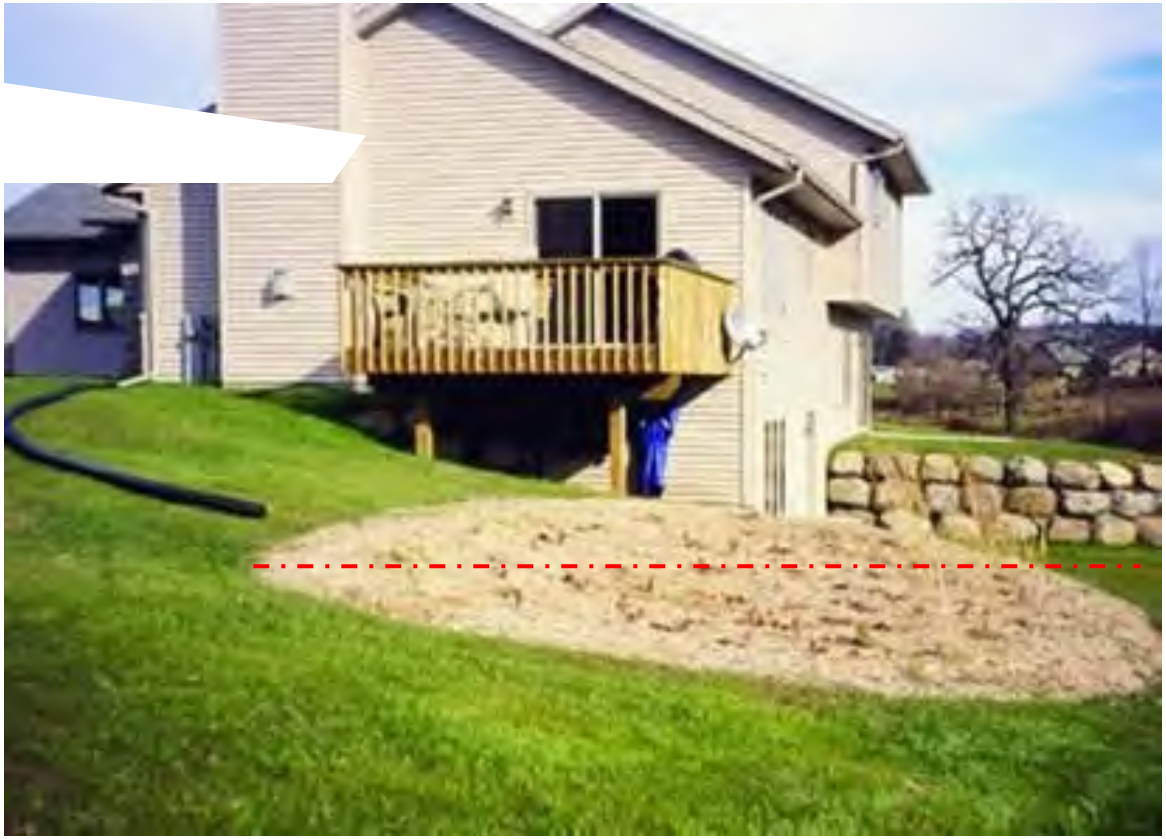
Tips on how to build your rain garden



Ground surface is relatively flat.

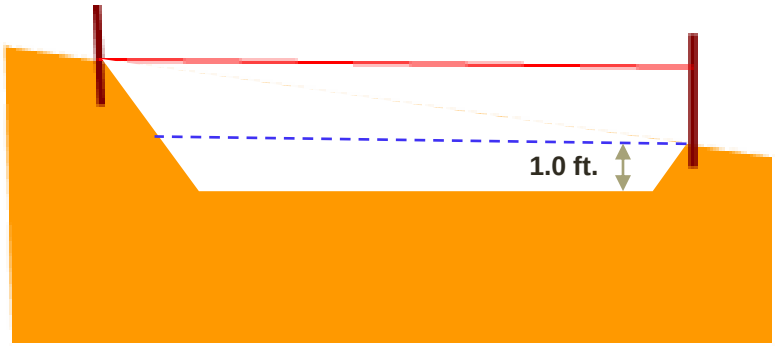
NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT

Tips on how to build your rain garden



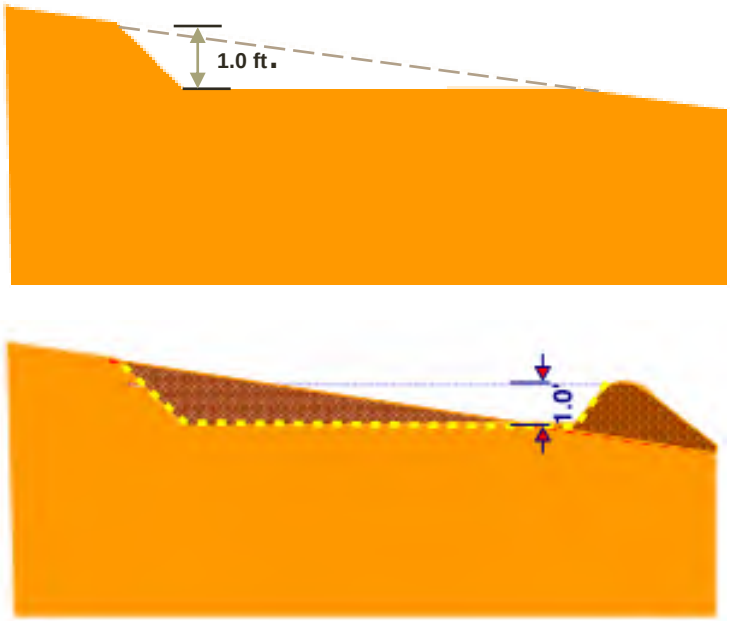
Ground surface is sloped.

Tips on how to build your rain garden



Ground surface is sloped.

Tips on how to build your rain garden



Ground surface is sloped.

Tips on how to build your rain garden

Ground surface is sloped.

Tips on how to build your rain garden

Ground surface is sloped.

Tips on how to build your rain garden

NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT

You can have a raised rain garden.

You can have a raised rain garden.

NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT

Inspection and maintenance needs and frequencies

Periodically and after major rain events:

- Check the inflow & outflow.
- Look for signs of erosion in and around the rain garden.
- Look for any damage to plants.
- Re-spread the mulch or compost if it has moved.
- Remove sediment and debris, clean the inflow and outflow structure, and repair any erosion.

As needed:

- Weed, prune the plants, and water especially during the first couple of years.
- Replace plants if needed.
- Add mulch/compost.

NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT

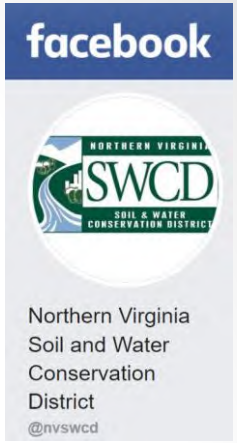
Before starting to build your rain garden, find out whether you need a permit.

For information regarding permits in Fairfax County contact:

Fairfax County Land Development Services
Engineer of the Day at 703-324-2268
or
https://www.fairfaxcounty.gov/contact/Mobile/MailForm.aspx?agId=70040

NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT

NORTHERN VIRGINIA SWCD SOIL & WATER CONSERVATION DISTRICT



Contact information:

Northern Virginia Soil and Water Conservation District

https://www.fairfaxcounty.gov/soil-water-conservation/

https://www.facebook.com/nvswcd

conservationdistrict@fairfaxcounty.gov

Contact form: https://www.fairfaxcounty.gov/contact/MailForm.aspx?agId=889

- **Watershed Calendar**, once per month, stream monitoring and environmental events, used as our general newsletter: https://lp.constantcontactpages.com/su/8Z7Hkab/watershedcalendar
- **Green Breakfast,** every other month, guest speakers on environmental topics**:** https://lp.constantcontactpages.com/su/TZxRp55/greenbreakfast
- **VCAP Notification List**, for those who want VCAP updates including notification for when the program opens: https://lp.constantcontactpages.com/su/J5vOroZ/vcap
- **Seedling Sale Notification List**, for those who want to be notified of when the seedling sale is announced and when it opens, sells out, etc.: https://lp.constantcontactpages.com/su/5XHCIcr/seedlingsale