

# How to Construct Your Own Rain Garden





# Rain Garden Walkthrough



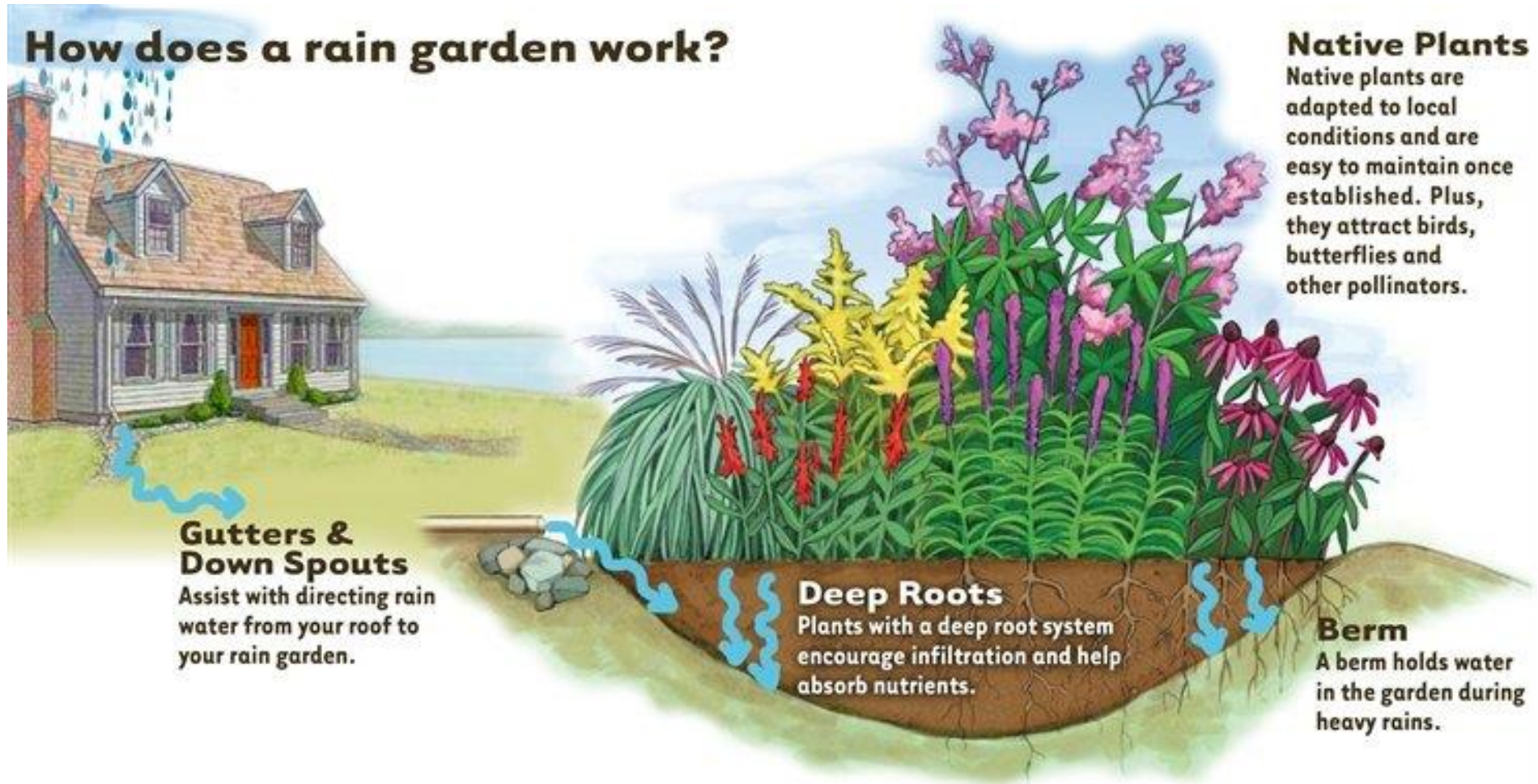


## What is a Rain Garden?

- A rain garden is a landscape feature that reduces stormwater runoff and water pollution, while providing wildlife habitat and a unique landscape aesthetic.
- A rain garden is a shallow depression that captures rainwater from impervious areas and infiltrates it into the ground.
- Rain gardens reduce runoff, thereby reducing the contaminants conveyed into our waterways.



## A Basic Diagram...



## Components of a rain garden

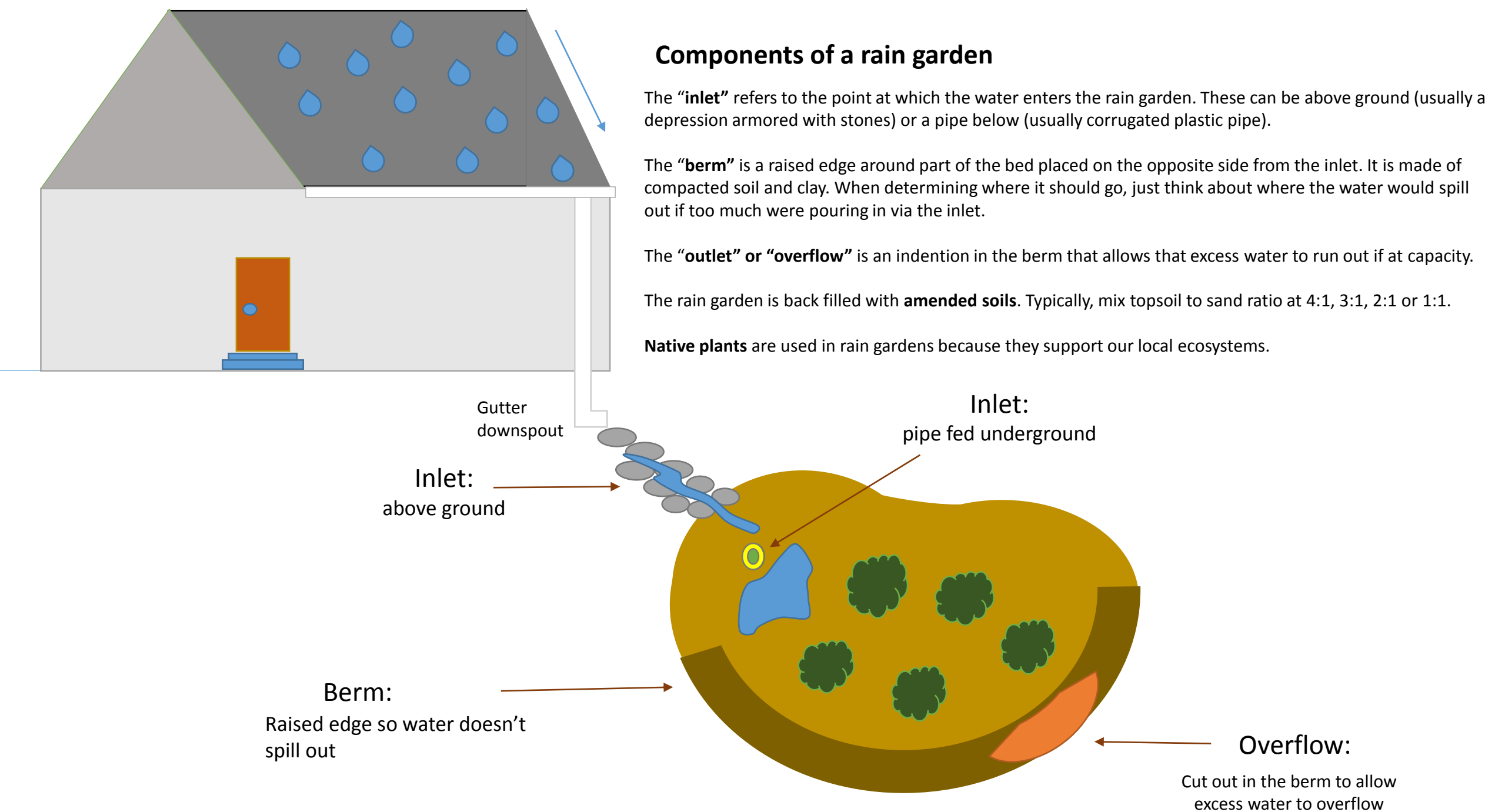
The **“inlet”** refers to the point at which the water enters the rain garden. These can be above ground (usually a depression armored with stones) or a pipe below (usually corrugated plastic pipe).

The **“berm”** is a raised edge around part of the bed placed on the opposite side from the inlet. It is made of compacted soil and clay. When determining where it should go, just think about where the water would spill out if too much were pouring in via the inlet.

The **“outlet”** or **“overflow”** is an indentation in the berm that allows that excess water to run out if at capacity.

The rain garden is back filled with **amended soils**. Typically, mix topsoil to sand ratio at 4:1, 3:1, 2:1 or 1:1.

**Native plants** are used in rain gardens because they support our local ecosystems.





# What Rain Gardens AREN'T

- A rain garden will NOT stop flooding (although many rain gardens adopted over a large area could reduce the frequency of floods)
- Rain gardens are NOT “water gardens” – designed as water features, or to hold water or stay saturated indefinitely
- Rain gardens are not necessarily “wild”
- Rain gardens are not necessarily low-maintenance



# Understand Hydrology

- Hydrology = Water Flows Downhill!
- As rainwater first hits the ground, it either infiltrates into the ground, or it moves over the ground's surface in "sheet flow"
- As it flows downhill, it gathers together, becoming "confined flow"
- Confined flow gains velocity and can become erosive

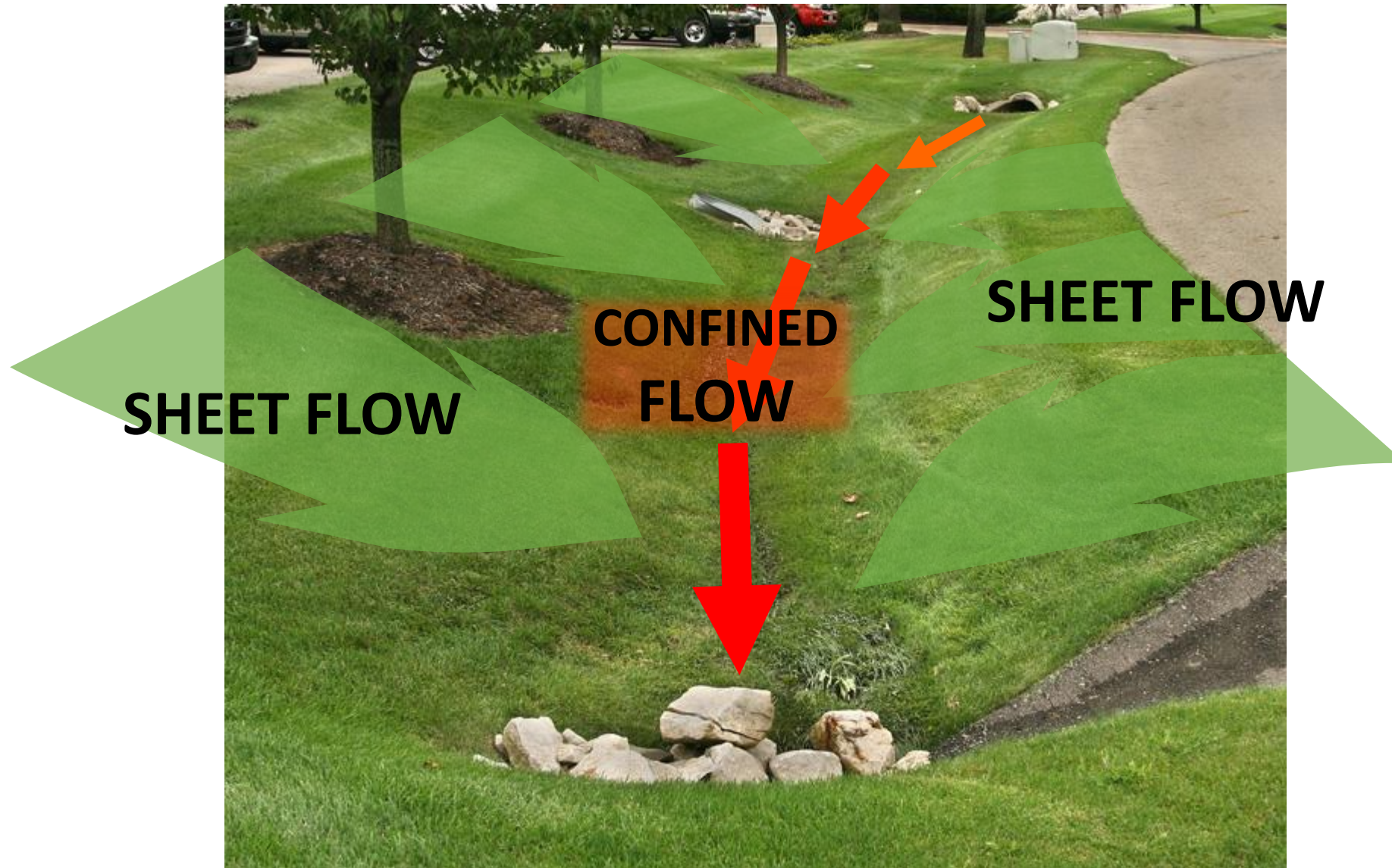


## Confined Flow





## RAIN GARDEN WALKTHROUGH



This picture is just to illustrate the difference between sheet and confined flow. Roadside ditches, or anywhere within the public right-of-way, are not appropriate rain garden sites.



# First Step to Building a Rain Garden: Identify Drainage Areas

- Water that infiltrates cannot pollute the storm drains.
- Water that falls on vegetation (pervious) infiltrates, but water that falls on impervious surfaces does not.
- Therefore, the first priority is to capture water from impervious areas, including roofs, driveways, and other paved areas (especially those *not* covered by trees)



Be mindful: Where the water is going?









# First Step to Building a Rain Garden: Identify Drainage Areas

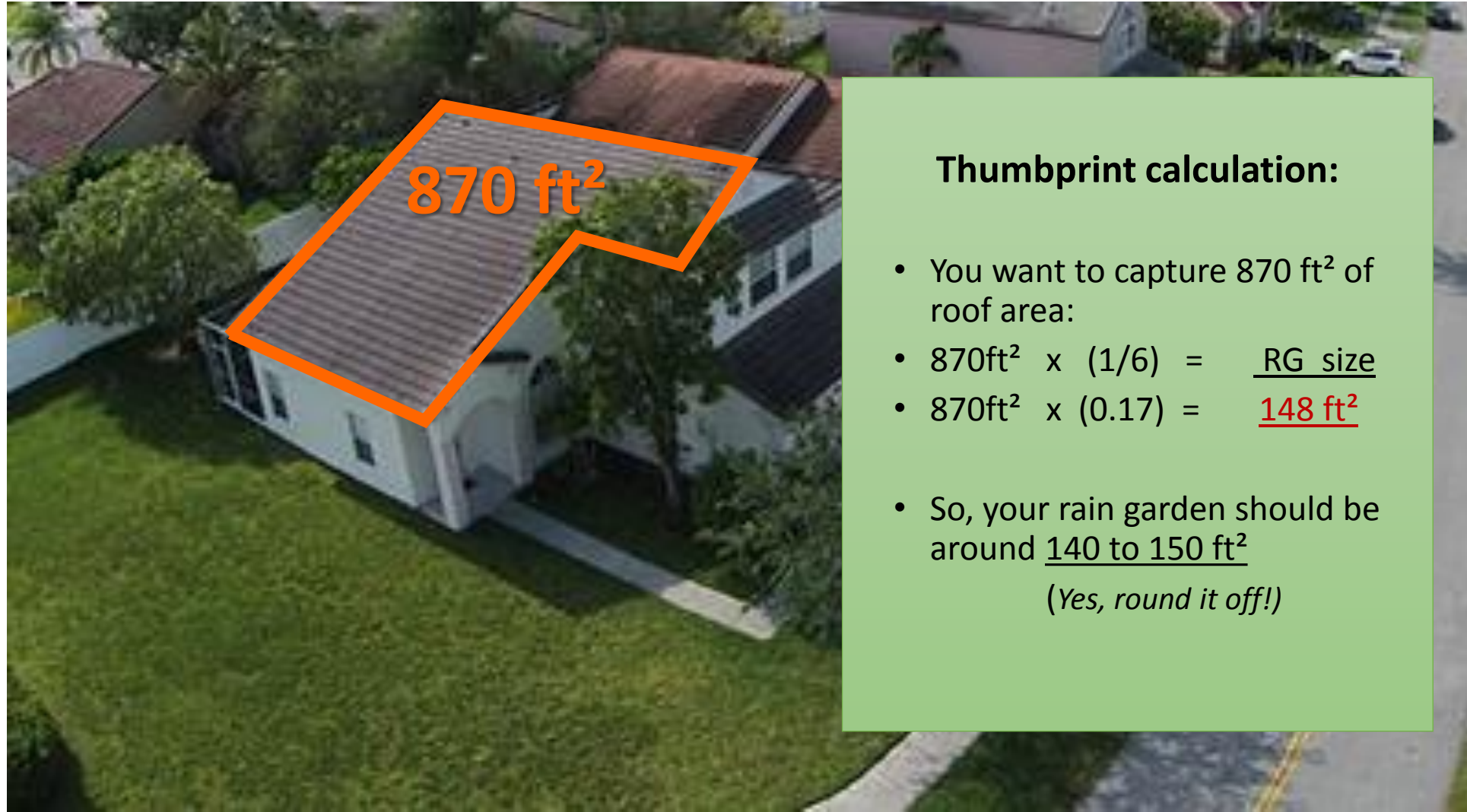




# Calculate Drainage Area (we did this for you)



# Calculate Rain Garden Size (We did this for you)



## Thumbprint calculation:

- You want to capture 870 ft<sup>2</sup> of roof area:
- $870\text{ft}^2 \times (1/6) = \underline{\text{RG size}}$
- $870\text{ft}^2 \times (0.17) = \underline{148 \text{ft}^2}$
- So, your rain garden should be around 140 to 150 ft<sup>2</sup>  
(Yes, round it off!)



# Placement of your rain garden

**IMPORTANT! Your rain garden must meet these criteria!**

- **NOT** in public right-of-way or utility easement, **NOT** in drainage ditches
- **10' AWAY FROM FOUNDATION**
  - The rain garden should be at least 10' from any building so that infiltrated water does not compromise the building's foundation or seep into a basement.
- **25' AWAY FROM SEPTIC**
  - Do not place rain garden near or over a septic tank, septic field, or sewer service.
- **25' OR MORE FROM WELLHEAD** – seek technical advice
- **PERCOLATING SOILS**
  - Rain gardens should be located in soils that infiltrate water – thus, do not place RG in a part of the yard where water ponds. This defeats the purpose of the rain garden, which is to infiltrate water.

# Locating the Rain Garden on Site – Other Considerations

- NOT TOUCHING WATER TABLE
  - Make sure water table is at least 2' below soil surface.
- FLAT GROUND
  - Rain gardens should be located in a relatively flat location, where the slope is ideally 3-8%, but no steeper than 8-10%. Locating a rain garden on a steeper slope will increase the required depth and the amount of labor required to install the rain garden.
- DOWN-SLOPE FROM HOUSE, not above house.
- **CALL 811**
  - Always call 811, a free hotline for locating any underground utilities. They ask that you call 72 hours before you dig. (But calling well ahead of time, once you have a rough idea of the location, can save you from having to seriously adjust your design, down the road.)



**Know what's below.  
Call before you dig.**



# Rain garden placement



# Test Soils for Percolation

- Percolation Test:
- If you have an area that you'd like to build a rain garden, dig a hole 18" deep and fill it with water. Wait until it drains, then fill it up again with about a foot of water.
  - If it has drained in 72 hours (3 days), this site has suitable soils for a rain garden.
  - If it does not drain in 72 hours, you should find a different location for a rain garden.
  - If it drains in around 24 hours, you have a "quick-draining" rain garden site, and you should select your plant palette accordingly.
  - (If it never drains, you may have clogged the hole when you dug it and poured water in! This happens in clay soils – Try making another hole.)
- If water stays ponded in this site year-round, you might want to consider a water garden or wet garden, but a rain garden is not for you.



# Placement of rain garden



● Perc test

Now we have a much more clear idea where we should put the RG.

# Test Soils for Texture

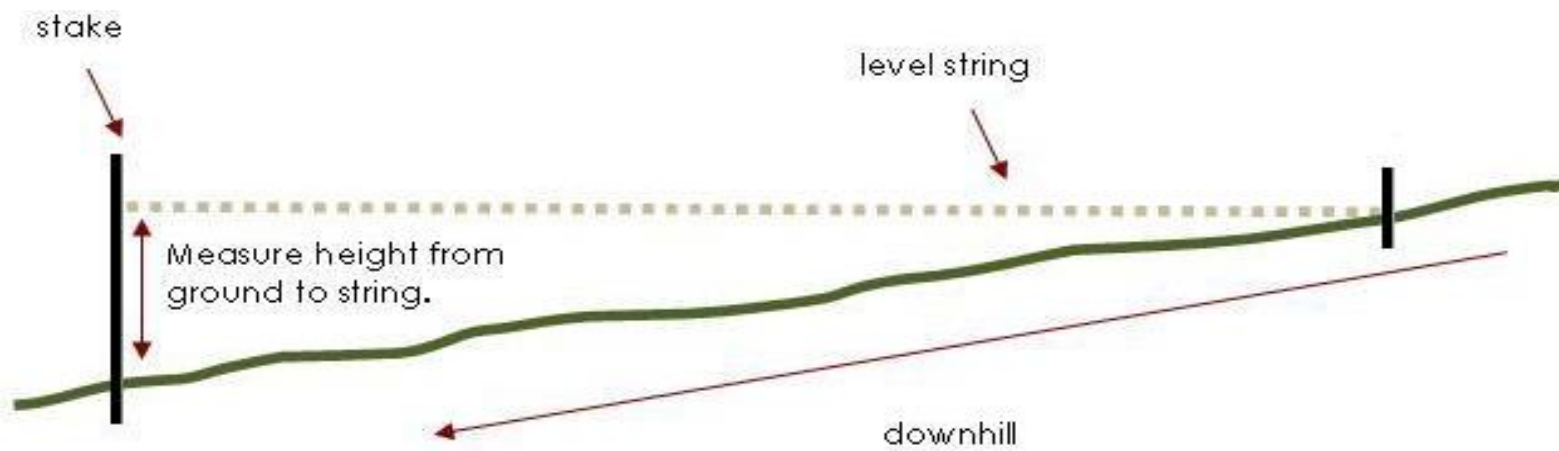
- Existing Soil Texture Test: Using a simple manual soil texture test, determine whether you have predominantly sandy or clayey soils.
  - Sandy loam soils will be suitable to use for rain garden fill soil. Clayey soils will need to be removed and replaced with sandier soil. Some of the clay can be used for constructing the berm.





## Measure Slope

1. Place two stakes, one at the top of the slope, the other at the bottom
2. Tie a string to the top stake level with the ground, and lead out to bottom stake
3. The difference between the height of each stake is the rise, the distance between the two stakes is run.
4. Select Depth:
  - Less than 4%, it is easiest to build a 3 – 5 inch deep rain garden
  - Between 5 and 7%, it is easiest to build a 6 – 7 inch deep rain garden
  - Between 8 and 12% it is easiest to build a 8 inch deep rain garden



**Generally, RainSmart applicants will want to use a ~6" ponding depth, and 8 to 12 inches of amended soil, totaling 14 to 18 inches of digging.**

# RAIN GARDEN WALKTHROUGH

WHY is it easier to build on a flat area? Look at the dark gray color...

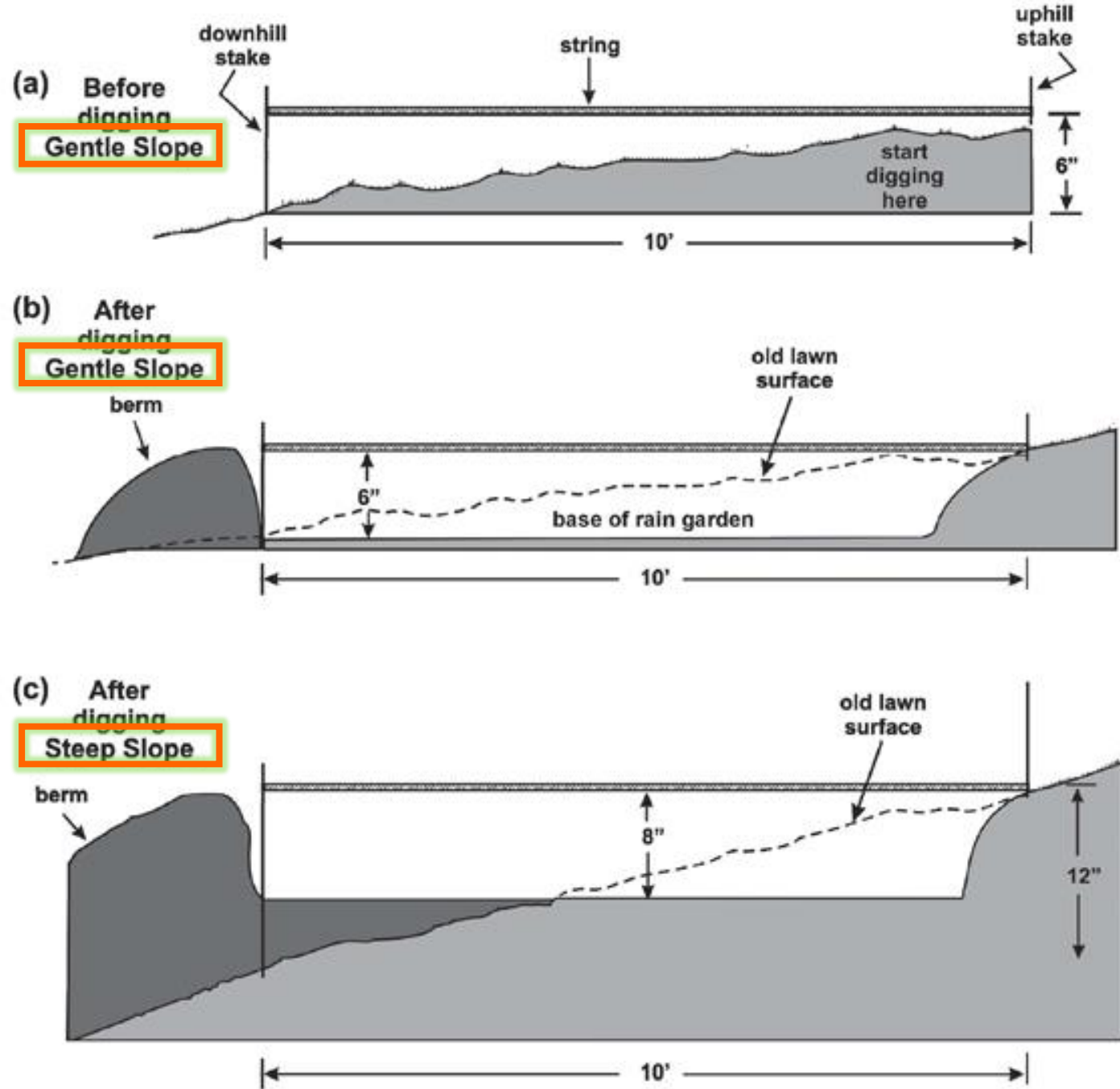
Rise / Run = Slope

$$6'' / (10' \times 12'') = 0.05$$

Or, 5% slope

$$12'' / (10' \times 12'') = 0.1$$

Or, 10% slope

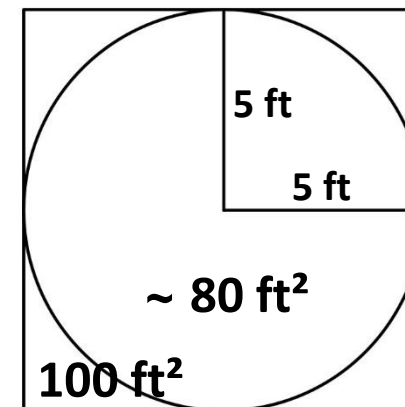
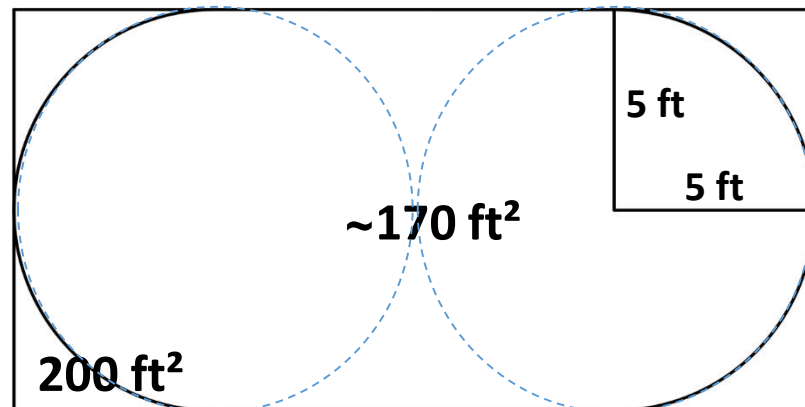




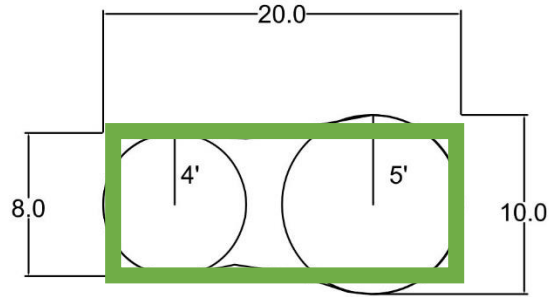
Now that you know where, and how big to build your RG:

## Create Rain Garden Shape

- Look at your overall landscape – the RG should fit into the site overall
- Rain gardens are usually oval or ellipse shaped; many people create “kidney bean” shapes
- Consider where the water enters the area, and where the overflow will be
- *Tip on estimating area of rounded shapes: Curves that are roughly circular result in around 80-85% of the surface area that would be contained in a square of the same size. So if you draw out a rounded 10'x20' RG, you'll have around 170ft<sup>2</sup>*



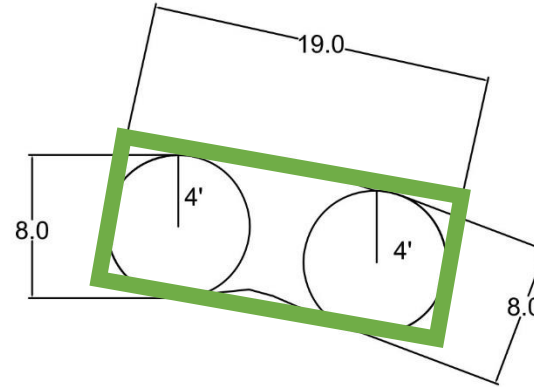
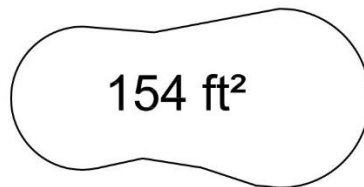
## Rough Measurements



$$9 \times 20 = 180$$

**Multiply by 85%**

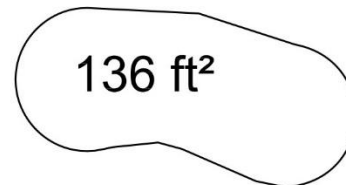
$$180 \times (0.85) = \underline{153 \text{ ft}^2}$$



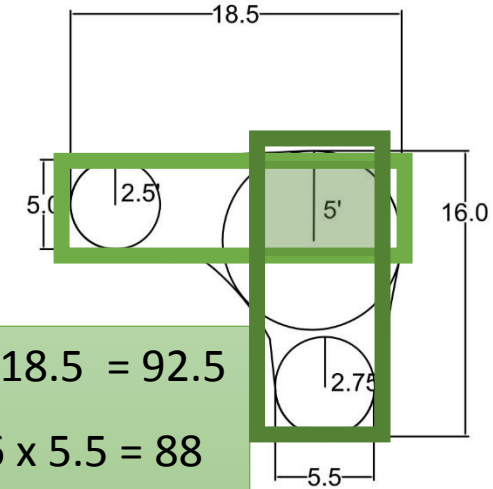
$$8 \times 19 = 152$$

**Multiply by 85%**

$$152 \times (0.85) = \underline{129 \text{ ft}^2}$$



Actual Area



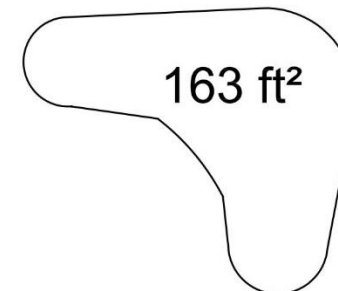
$$5 \times 18.5 = 92.5$$

$$16 \times 5.5 = 88$$

$$92.5 + 88 = 180.5$$

**Multiply by 85%**

$$180.5 \times (0.85) = \underline{153 \text{ ft}^2}$$





# Marking Your Rain Garden

## Outline your rain garden with spray paint

Tip: You can use a garden hose to help create smooth curves

## Mark the inlet and overflow

How is the water getting to the rain garden? In sheet or confined flow? If flow is confined, you will need to “armor” the inlet with rock or very durable groundcover

The water will leave the rain garden through an overflow that is relatively confined. It will need to be armored with rock and/or groundcover, depending on the width of the overflow. Wider overflow areas are less confined and may use less rock or no rock. Thinner overflows are more confined and will require rock.



# Are you ready to build?

### Did you:

- CALL 811
- Percolation test done
- Marked inlet and overflow
- RG away from septic fields, building foundations, etc.
- Made sure water is safe to overflow as you've designed it
- Site is NOT in the public right-of-way
- Slope of site is under 6%



## Construct Rain Garden

### Ten Steps:

1. Set Reference Stake
2. Remove Sod
3. Remove Topsoil
4. Remove Underlying Clay
5. Use Clay to Create Berm
6. Create Outlet
7. Amend Soil
8. Replace Soil and Rake
9. Plant
10. Mulch





## RAIN GARDEN CONSTRUCTION



1. Reference Stake – above, not below rain garden



2. Remove  
Sod



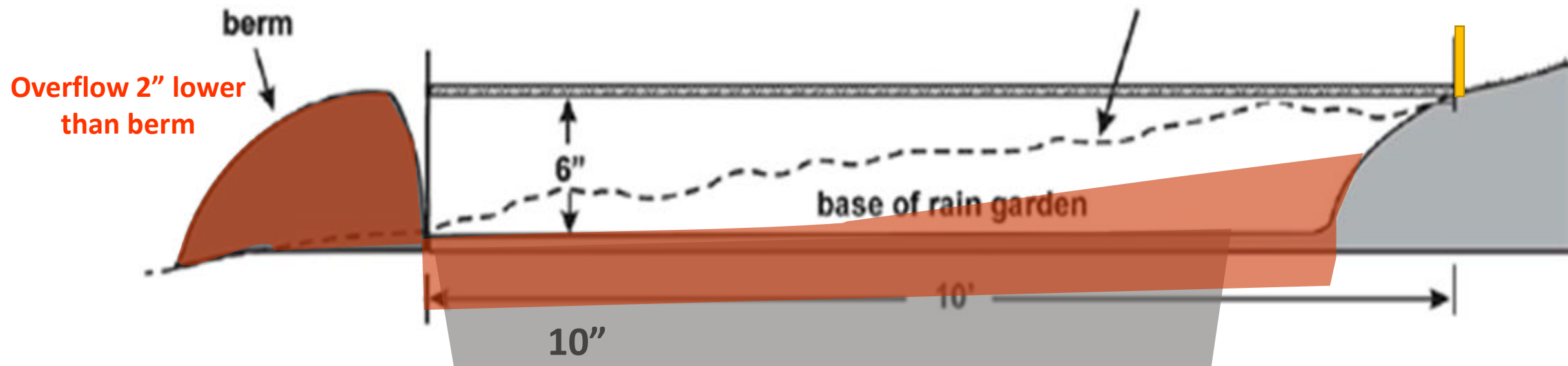
3. Remove  
Topsoil





## 4. Remove Clay; 5. Create Berm

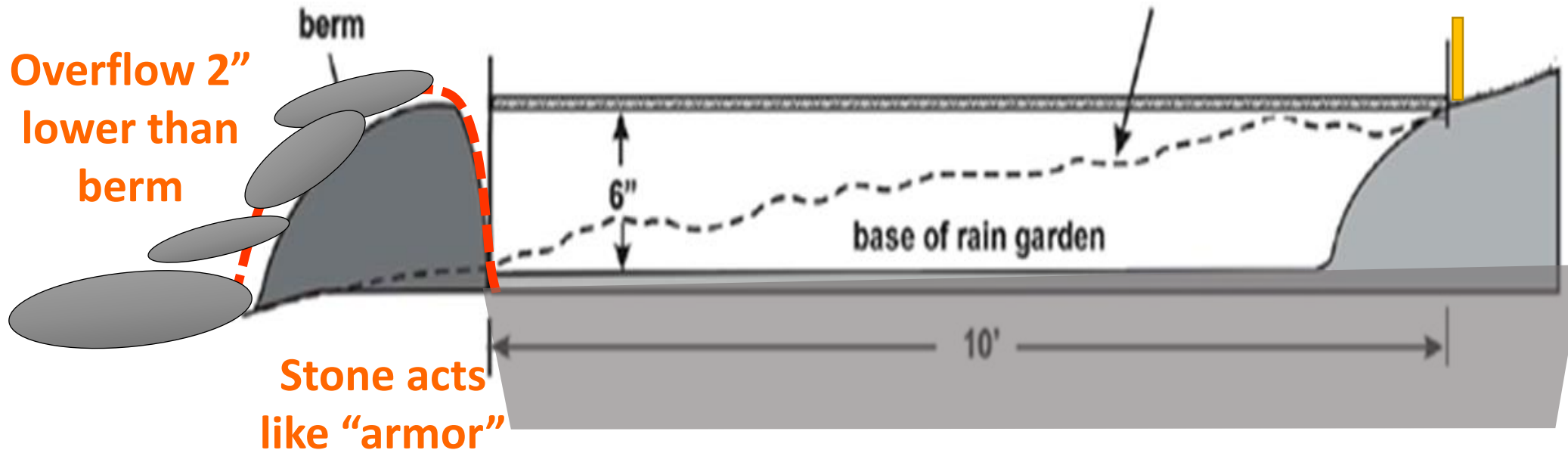
- Remove underlying clay soil
- Begin piling soil on berm. As you pile it, every two to three inches, compact the clay using a tamping rod or other method.
- At this point you will have to start checking your depth. You want to dig down to **BELOW** the bottom of the finished rain garden – because you are going to backfill with your amended soils
- If your ponding depth is 6", and you're backfilling with 10" of amended soil, you should dig down to a total of 16" deep.





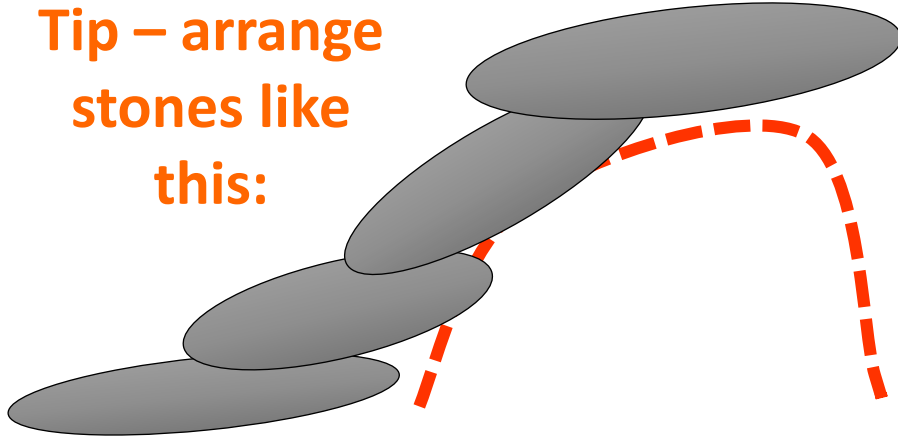
## 6. Create Overflow

- The overflow area should be around 1 to 2 inches lower than the berm height
- Take into account the thickness of stones you will use to armor the berm. You can also use other materials – get creative!

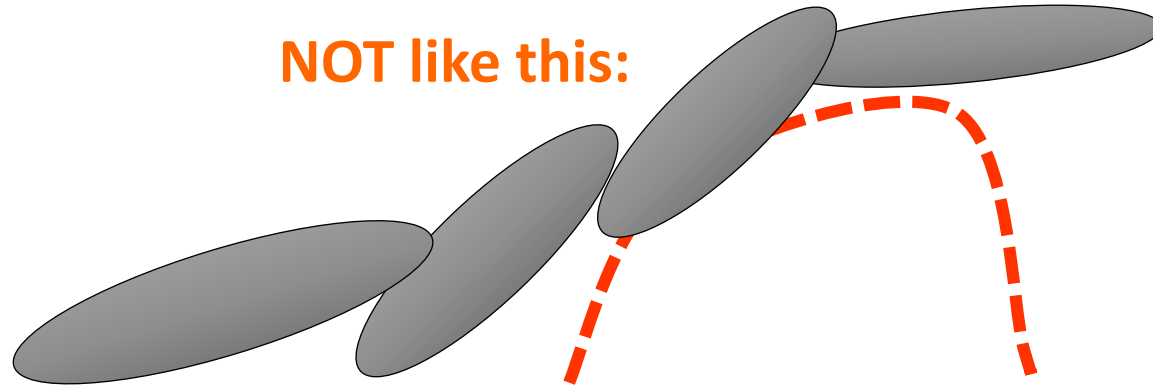


# RAIN GARDEN CONSTRUCTION

Tip – arrange  
stones like  
this:



NOT like this:

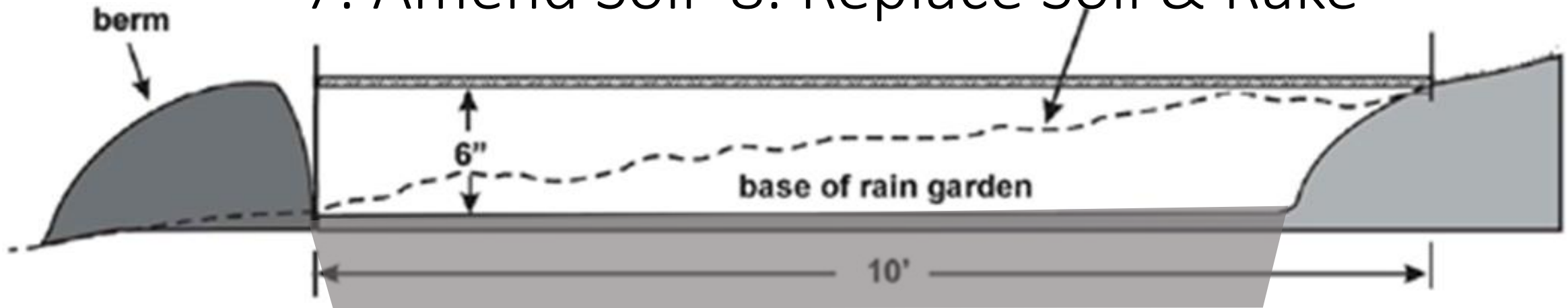


## 7. Amend Soil 8. Replace Soil & Rake

- Fill rain garden back in with amended soil to the height appropriate height to achieve your storage depth. In other words, 6" below your overflow if you want a 6" storage depth, etc.
- The amended soil should be sandy
- You can mix 1-3 scoops of sand with your topsoil (**DO NOT use mortar sand**)
- Typically, mix topsoil to sand ratio at 4:1, 3:1, 2:1 or 1:1.
- If your sand is very clayey, you probably won't be building an RG anyway.
- Add between 2 and 10 bags of mushroom compost – DON'T use chicken manure compost!! (too much nitrogen)



## 7. Amend Soil 8. Replace Soil & Rake



**Amended soil is between 4 and 12" typically,  
may be greater for heavy clay soils**



***Be extremely careful not to compact the underlying clay or any clay going into the amended soils, as this ruins porosity and is very difficult or practically impossible to correct! Do NOT walk or drive on clay soils when they are wet! Remember, YOU are heavy enough to compact soil!***







## My Tennessee: Clean Water Starts Here Homeowner Questionnaire

*Complete the checklist, and make an appointment for an onsite assessment by emailing  
mytennessee@caribbean-sea.org*

Name \_\_\_\_\_ Watershed \_\_\_\_\_

Address \_\_\_\_\_ Date \_\_\_\_\_

Email Address \_\_\_\_\_

Phone Number \_\_\_\_\_

**GOAL: Our goal is to encourage the reduction of stormwater runoff, in turn, reducing pollution in our waterways.**

### BRONZE LEVEL

where complete or N/A where not applicable

- Remove or avoid using invasive/exotic plants. (To see a list of discouraged plants - <http://tnipc.org/invasive-plants/>)
- Incorporate native plants into landscape. <http://www.wildones.org/>
- Use organic pine straw, pine bark, leaves or hardwood mulch without added dyes
- Protect all soil surfaces with vegetation to minimize erosion by rainfall and runoff
- All trash from property is properly disposed of and not left on ground
- Grass clippings are left in place, composted or properly disposed of and lawn is mowed no shorter than 3 inches
- Adjust sprinklers to avoid hitting paved surfaces and calibrate the output as directed by plant needs, using a rain gauge if needed



- Disconnect downspouts, directing them onto a lawn or garden rather than into drainage channels, onto impervious surfaces, or into waterways
  - Plant a pollinator garden <http://eeintennessee.org/resource/about.aspx?s=99061.0.0.37935>  
<https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/plantsanimals/pollinate/>
  - Personal care products, pharmaceuticals and all toxic substances, including automotive vehicle fluids, are recycled or disposed of in accordance with EPA recommended practices <https://www.epa.gov/hw/household-hazardous-waste-hhw>
- Yes      No
- Do you have a pet? If so, all animal waste is collected and disposed of in the trash or composted or buried a minimum of 10 feet from stormwater access point and waterways
  - Do you use pesticides or herbicides? If so, spot treat only affected areas using environmentally friendly pesticides/herbicides such as horticultural oils and insecticidal soaps
  - Does your property touch a waterway/stream? If so, maintain a mix of native trees, shrubs, grasses and wildflowers along water's edge, creating a vegetated width that is as wide as practical, creating a buffer zone that is not maintained by mowing, fertilizers or pesticides along waterways <https://www.tn.gov/agriculture/article/ag-forests-riparian-buffer>
  - Do you have a septic tank? If so, have it regularly inspected to prevent drainage entering the waterways <https://www.epa.gov/septic/how-care-your-septic-system>

## SILVER LEVEL

where complete or NA where not applicable

- If you fertilize, obtain a soil test, and maintain soil pH in the recommended range. Do not apply fertilizers in wet weather.  
<https://extension.tennessee.edu/Hamilton/Documents/Agriculture/Soil%20Testing/Soil%20Testing%20Packet.pdf>
- Build a rain garden to catch and filter stormwater runoff  
[http://www.chattanooga.gov/images/Water\\_Quality/How\\_to\\_Construct\\_Your\\_Rain\\_Garden\\_for\\_Homeowner.pdf](http://www.chattanooga.gov/images/Water_Quality/How_to_Construct_Your_Rain_Garden_for_Homeowner.pdf)
- Use rain barrels or rain collection systems to catch rooftop runoff OR direct downspouts to rain gardens or other green infrastructure.

<http://www.chattanooga.gov/component/content/article/44-public-works/1514-rain-barrels>

- If space allows, add native trees to property  
[https://ag.tennessee.edu/tnyards/Documents/Native\\_Trees\\_for\\_Tennessee.pdf](https://ag.tennessee.edu/tnyards/Documents/Native_Trees_for_Tennessee.pdf)
- Employ low-flow fixtures throughout dwellings and structures
- Use environmentally friendly sealers (no coal-tar or petroleum based) when maintaining paved surfaces <http://www.chattanooga.gov/component/content/article/44-public-works/1515-miscellaneous-bmp-s>
- Increase buffer zone to waterways to a minimum of 30 feet where possible - area not maintained by mowing, fertilizers or pesticides that includes native trees, shrubs, grasses and wildflowers.

Yes

No

- Are there areas of the property with erosion problems? If so, implement best management practices to control. For example: planting vegetation to stabilize soil or adding swales where applicable  
<http://www.chattanooga.gov/component/content/article/44-public-works/1515-miscellaneous-bmp-s>

## GOLD LEVEL

where complete

- Construct additional green infrastructure such as a wetland or bioswale
- Dishwasher, washing machine and water heater are Energy Star® rated
- Replace all impervious pavement with pervious concrete, pavers or other alternatives such as grass pavers