



RAIN GARDEN DESIGN

UNIVERSITY OF
Nebraska
Lincoln

EXTENSION

Know how. Know **now**.
EC1262

Site Selection and Sizing Guide

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This is an interactive publication, and is best viewed digitally, whether you're using a computer, iPad®, or other device. Throughout the guide, be sure to explore the videos, animations, slideshows, and other interactive elements to help supplement the information presented.

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SECTION 1: Getting Started

This section provides basic information needed before starting the rain garden design process.

What Is A Rain Garden?

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GETTING
STARTED

What Is a Rain Garden?

Quick Facts About Rain Gardens

Rain gardens are aesthetic and functional landscape features that retain rainwater, provide beauty and habitat, and can reduce water runoff from your property. A rain garden is a small, shallow area in a residential yard or neighborhood designed to temporarily capture rainwater that drains from a house roof, driveway, or other open area.

A rain garden is not a pond, water garden, or wetland. It is dry most of the time and briefly holds water after a rain. Rain gardens typically are planted with a mixture of deep-rooted perennial flowers, ornamental grasses, and woody shrubs that are adapted to wet and dry conditions. Water collected in the rain garden slowly infiltrates into the soil to support plant growth and lessen runoff into storm drains and nearby streams or lakes. In a properly sited and constructed rain garden, standing water disappears within 24 to 48 hours.



Click the image below to explore a more in-depth look at rain garden facts.



Well-designed rain gardens:

- blend into the adjacent landscape,
- match the aesthetic character and scale of the existing landscape, and
- may not be recognized as a separate garden designed to capture and filter runoff.

Other characteristics that rain gardens share with traditional, sustainable, low-maintenance landscape beds include:

- a layer of organic mulch to minimize weed growth and enhance soil moisture during drought periods,
- a selection of plants that do not require pruning or extensive chemical or fertilizer treatments, and
- well-defined bed edges that establish a maintained appearance often warranted for public acceptance in an urban landscape.

Design Diversity Slideshow

Click through the thumbnails above to see diverse examples of garden design.

Roof tops, sidewalks, driveways, and patios do not allow rainfall to infiltrate into the soil.

These impervious areas increase the amount of runoff from urban areas, which can cause flooding and carry pollutants to surface water. Rain gardens capture runoff from these areas and reduce the effects of flooding and runoff pollution.

In addition, rain gardens provide many visual benefits, including diverse plantings of flowers, grasses, and ornamental plants; berms that add height, contrast, and texture to landscapes; and habitat value for birds, insects, and other wildlife.

Given all of the benefits that well-designed rain gardens can provide, they are relatively inexpensive and can be designed and installed with minimal training, tools, and resources. This publication describes the steps for designing a successful rain garden. Alternately, local landscape companies may have experience building rain gardens, or would be willing to install one based on information in this publication series.



Rain garden landscape shared between two houses.



Rain garden on a Midwest college campus.

Video | Designing Your Garden

Rain gardens are placed to capture runoff from a house roof, driveway, large patio, or other impervious surface.

Depending on the layout of the gutter system on a home or the size of the property, more than one rain garden may be needed to collect all runoff.

Rainwater also may be captured from several surfaces and directed into one garden if site conditions and runoff areas are best addressed through a combined garden.

The soil texture and structure are critical for effective rain garden function. The soil must allow rain to move from the soil surface into the soil structure fast enough so when the rain garden is full, plants do not stand in water for more than 24 to 48 hours. Tests to determine infiltration rates will be described later in this publication. If the soil does not meet this criterion, or cannot be amended to enhance infiltration, this may not be the right site for a rain garden.

When properly designed, rain gardens require similar — or even less — routine maintenance (e.g., removing weeds, replacing dead plants, watering during drought) compared to typical landscape planting beds.

Other general design considerations include proper sizing of the area and depth of the garden; proper placement to maximize rainwater runoff capture as well as minimizing conflicts with building foundations, septic/water well systems, and existing trees or other vegetation; and integration into the existing landscape to reduce maintenance and enhance overall

landscape beauty. Because rain gardens are designed to hold water temporarily, they are not a breeding ground for mosquitoes or other pests.



Rain garden design begins with an inventory of the general character of the landscape and the impervious areas within the landscape that collect rainwater.

The inventory checklist at the right will help you begin to assess where your proposed rain garden might best fit functionally and aesthetically.

Landscape Inventory Checklist

- Note the location of downspouts that concentrate roof runoff and from which roof area the water runs to each downspout.
- Consider adjoining landscape areas where a garden would fit aesthetically and functionally.
- Visualize where a heavy rainstorm would send water if the garden overflows.

Collecting Data For Your Rain Garden

Once you have a general understanding of the site, use the step-by-step design process in the next section to determine and document specific information you'll need to design your rain garden. This process will help identify the best location, size, and depth for a garden and provide important information for its design. The information also may indicate that the proposed site is not appropriate for a rain garden.

This design process is for a typical garden and uses average measurements and conditions. The Design Size Worksheet is provided to help you design your specific garden. Learn more about the Design Size Worksheet in the box on the right of this page.

Design Size Worksheet

The Design Size Worksheet is a tool you will use throughout the steps in Section 2 (pages 10–25). Throughout Section 2, keep an eye out for this graphic: **Design Size Worksheet**.

Whenever that graphic appears, be sure to record your data from the instructions on the Design Size Worksheet.

Access the worksheet with the button below, and you may either print it out or save it to your computer or other device so you can follow along while going through Section 2 of this guide. It is recommended to complete the worksheet on your computer because as you type in your data, the worksheet will automatically calculate your findings as needed. If you print out the worksheet, you can either do the math by hand, or record your data by hand and use the electronic worksheet later to calculate your findings.

Open the **Design Size Worksheet**





SECTION 2: Site Selection and Sizing Process

This section provides step-by-step instruction on site selection and sizing your rain garden.

Step 1: Identify potential rainwater sources and learn how to direct them into the garden.

Step 2: Measure the areas that will collect the water to determine water volume.

Step 3: Determine where to locate your rain garden.

Step 4: Test your soil to determine its infiltration rate.

Step 5: Size the garden area and depth. Incorporate inlet and overflow locations.

Step 6: Determine the shape and general appearance of the garden in the existing landscape.

Additional Resources

Step 1

Identify potential rainwater sources and how to direct them into the garden.

During a rainfall (the heavier the better, ideally a minimum of 1 inch), take a close look at where the water is captured and where it flows on the site.

You will find that the most common sources of rainwater runoff on your property include:

A downspout or combination of downspouts from your roof.

Most houses have gutters and downspouts to collect rainwater. The water draining from a roof is normally clean. It may contain some metal from roof flashing or bacteria from bird droppings, but a rain garden is capable of filtering out these pollutants.

Runoff that flows onto your property from your driveway, walkways, or patios as well as neighboring patios or driveways.

Normally, these features drain in a specific direction. Take advantage of how your driveway or patio drains to collect runoff and return it to the ground. Rainwater running across your driveway can pick up small amounts of oil, grease, and salts that will be filtered by a rain garden.

Common Sources of Rainwater



A gutter downspout collecting water from your roof is a common source of rainwater for your garden.



This rain garden collects runoff from the street.

Step 2

Measure the areas that will collect the water to determine water volume.

Design Process | Step 2

Video | Measuring Roof Drainage Area

The next step is to measure the area of your roof and other areas that will drain to your rain garden. This process is described in the video on this page, and illustrated in an animation on page 13, as well as described in the figures on page 13.

1. Observe how rain runs off your roof, patio and/or driveway.
2. Mark areas (after they're dry) where the flow of water is directed from your patio or driveway. For example, if one-half of your driveway drains to the street and one-half drains to your yard, measure the area that drains to your yard.
3. Record your measurements in [Step 1A](#) of the [Design Size Worksheet](#). It will automatically calculate the area of each portion of your roof, driveway, and/or patio that drains to the portion of your yard where you will have a rain garden.



Measure the roof area that will collect the water to determine water volume for your rain garden. The process is described on this page and also in the animation.

Animation | How to Measure Your Roof Drainage Area

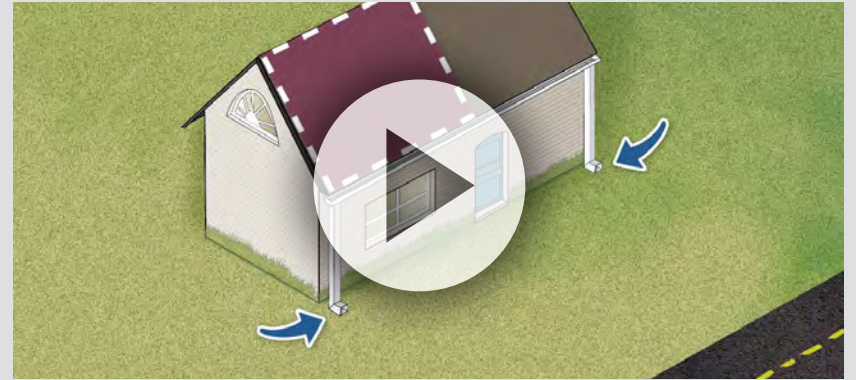
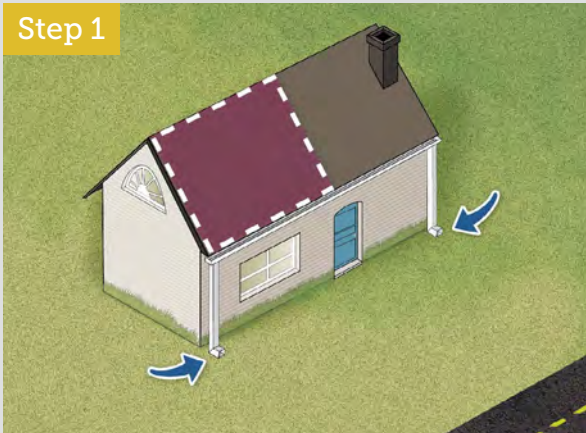


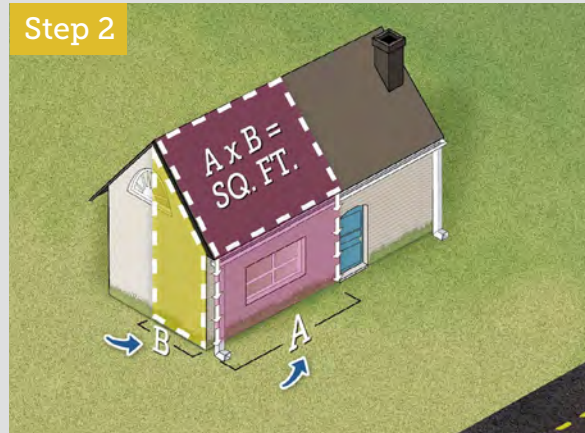
Illustration | How to Measure Your Roof Drainage Area

Step 1



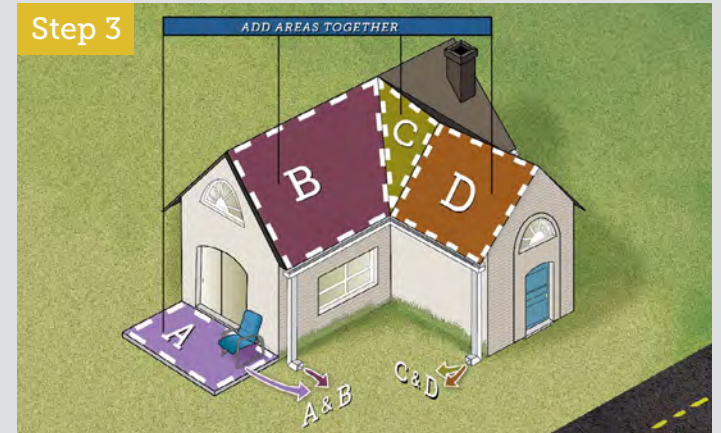
Step 1: Visually divide your roof into segments. To do this, observe where downspouts are attached to gutters and estimate how much roof area leads to each gutter. For complex roof and gutter layouts, make your best guess as to how much of the roof drains to each gutter.

Step 2



Step 2: Take measurements of one segment of the roof while on the ground. Record your measurements of **length** (A) and **width** (B) in **Step 1A** of the **Design Size Worksheet**. Repeat taking these measurements for each roof segment.

Step 3



Step 3: Look for and add in the measurements of other surfaces such as patios, other roofs, and driveways that may drain to your rain garden. Estimate the **length** and **width** of those areas and record them in **Step 1A** of the **Design Size Worksheet**.

Dos and Don'ts When Choosing Location

Things to consider when
choosing your location:

- Place a rain garden along a gentle slope less than 12% where it can capture the most runoff from the roof or other impermeable areas.
- Examine the layout of downspouts from the roof and determine which ones drain runoff from the largest roof area.
- Look at the lay of the landscape and determine where water collects and flows to certain spots.
- Rain gardens can be placed near a single downspout or located away from the house to capture runoff from more than one downspout and from other impervious areas in the yard, such as a patio.
- Consider how a proposed location fits into the overall landscape features of the yard. This is a garden and should be located to complement the house and other yard features and be a source of enjoyment for the homeowner and others.

- ✓ **Do** place your rain garden at least 10 feet away from the house to avoid water draining toward the foundation.
- ✓ **Do** locate rain gardens on gently sloping ground.
- ✓ **Do** locate your rain garden away from buried cable, gas lines, pipes, and septic drain fields. Call Diggers Hotline at 1-800-331-5666 to locate major underground utilities in Nebraska.
- ✓ **Do** be aware of runoff from the yard next door or from other locations that may drain into your garden location.
- ✓ **Do** choose an area with enough yard space to accommodate the water holding area and additional soil berms.

- ✗ **Don't** place your rain garden more than 30 feet away from the house, unless water is directed to the rain garden by a swale (a shallow channel lined with vegetation or stone) or underground pipe.
- ✗ **Don't** locate your rain garden on ground that slopes more than 12 percent.
- ✗ **Don't** locate your rain garden on top of or near buried cable, gas lines, pipes, and septic drain fields.
- ✗ **Don't** place your rain garden under existing trees due to potential conflicts with tree roots, and avoid densely shaded locations which typically do not support healthy plant growth. A lightly to moderately shaded location should be planted with shade-tolerant plants.
- ✗ **Don't** exceed 300 square feet in water holding area. Consider dividing a large garden into smaller multiple gardens.

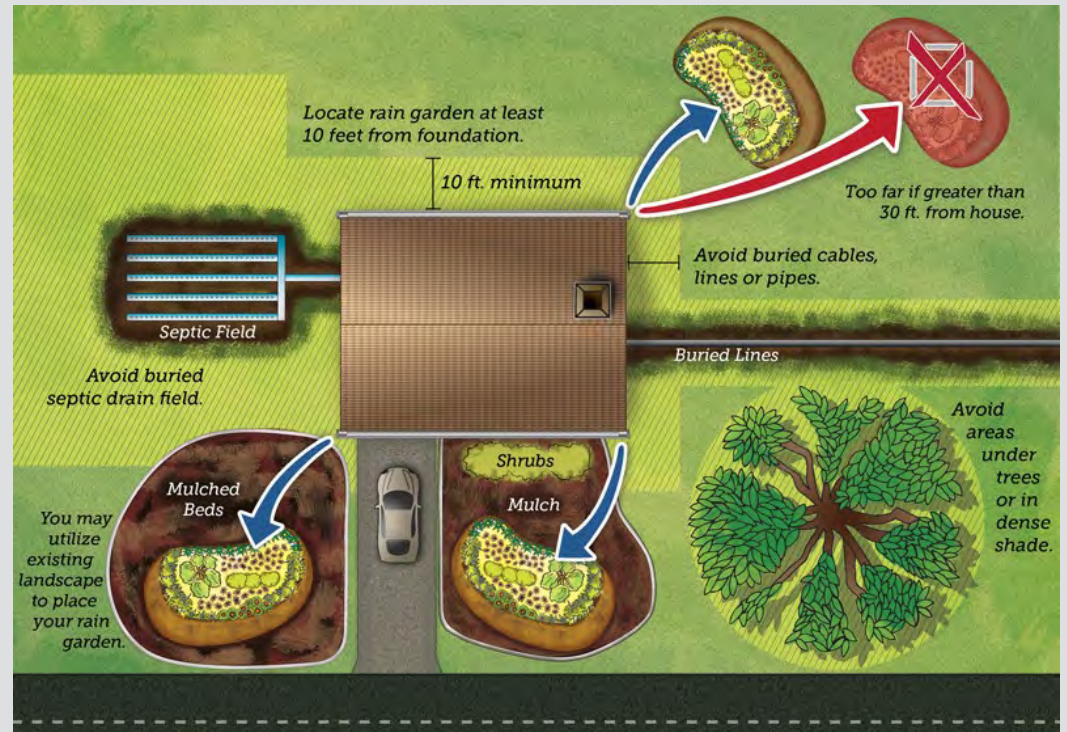
Avoid Low Spots

Locate rain gardens based upon drainage patterns, slopes, and aesthetic considerations. However, do not locate a rain garden in a low spot in the yard that usually ponds water after a rain. Ponding of water usually indicates water cannot flow away because of poor landscape grading, compacted soil, or because it is a low-lying area. Infiltration will be too slow for the rain garden to be effective.

Incorporate into Landscaping

Rain gardens may be situated within turf areas or in mulched landscape beds that contain other plants and landscape features. Although rain garden “islands” surrounded by turf may be straightforward to install, they tend to visually “float” in a landscape rather than help define landscape space, and they create additional edges that must be maintained. When gardens are located at the edge of a lawn area rather than in the middle of a turf space, they require less maintenance and more effectively enhance the landscape structure and the definition of space.

Visualizing Your Rain Garden Location



Test Your Knowledge With the Interactive Rain Garden Placement Tool

Study the figure above. Now that you know the “Dos and Don’ts” of rain garden location, test your knowledge by choosing rain garden sites in a yard with the Interactive Rain Garden Placement Tool on page 16.

[Interactive Rain Garden Placement Tool](#)

Interactive Rain Garden Placement Tool

Click spots in the yard to test your knowledge on appropriate placement of a rain garden.



Avoid steep slopes.

Gardens built on slopes of greater than 12 percent will require excessive soil digging and leveling which may not be as structurally sound as a garden on a site with less slope.

To determine the ground slope at the proposed site:

1. Place a stake vertically in the ground on the uphill side of the garden area.
2. Place a second vertical stake 100 inches directly downslope from the first stake.
3. Tie a string to the first stake at the ground surface; then attach the other end of the string to the second stake so that the string is level. Tip: Use a mason's string level or a carpenter's level to make sure the string is level, not parallel to the ground.
4. Measure the length in inches from the ground to the string on the second stake. This measurement is the percentage of the slope of the ground surface. For example, if you measure 6 inches from the ground to the string, the slope of the ground between the stakes is 6 percent.

Video | How to Determine Land Slope



Slope Calculator

Enter your measurement from the slope test described in the video, and your slope will be automatically calculated below.

Length in inches from the ground to the string: inches

Your slope is: %

Tips for Managing Soil

Not all soils are suitable for a rain garden.

As a rule, the infiltration rate should be greater than $\frac{1}{4}$ inch per hour, or approximately 6 inches per day. Soils with rates less than this may drain too slowly for an effective rain garden. Soil texture and structure are critical to drainage and infiltration. Soil is made up of three particle types – sand, silt, and clay – each in differing amounts. Soils high in sand and silt will usually provide good drainage. Soils high in clay will not drain well and may not be suitable for a rain garden.

Soils vary dramatically from location to location and can vary within the same yard. Also, topsoil is typically removed from many home sites before construction begins. This exposes the subsoil, which often has a higher percentage of clay and a slower infiltration rate.

To better understand the suitability of the soil where you want to build your rain garden, you'll need to test the soil.

Testing can help you determine how well the soil drains and whether organic matter should be added to improve drainage. If you determine that the soil at a particular site has little to no capacity to drain, find another location to build your rain garden.



Typical home construction site with soil stripped of topsoil, putting the tighter, clayey subsoil, which is unsuitable for rain gardens, at the top.

The ideal soil for a rain garden is high in sand and silt. If you know your soil does not fit the profile, the most important thing you can do to improve soil drainage is to mix in organic matter (compost, peat moss, etc.)

If your soil is high in sand and very porous, infiltration will typically be rapid and plants will be more prone to suffer drought stress. Adding organic matter will provide more water holding capacity for the soil as well as improve soil structure and texture.

If your soil is high in clay, infiltration will typically be very slow. Organic matter should be mixed in to help make the soil more porous. Although it seems logical to add sand to clay soil to make it more porous, it will typically do just the opposite and create a concrete-like soil that will not drain.

Your soil must drain at least $\frac{1}{4}$ inch of water per hour to be suitable for a rain garden. Use these two methods to test the soil at your proposed rain garden site.

Method 1: The Ribbon Method

Determine the relative clay content of your soil by using the “ribbon method.”

1. Take a handful of soil from your garden and wet it to a moist, plastic condition so you can easily mold it.
2. Gently squeeze the soil between your thumb and forefinger, forming a ribbon until it breaks off.
3. If the ribbon is longer than $1\frac{1}{2}$ to 2 inches, it has more than 30 percent clay and is not suitable for a rain garden without soil amendments.



The Ribbon Method

Method 2: Drainage Test

Conduct a drainage test by digging one or two holes in your garden area. Do this in the spring during a typical rainy season, not in the hot summer when soil can dry and crack, giving a false measurement.

1. Make the hole about 8 inches in diameter and 8 inches deep; then fill to the top with water. Allow the water to drain out of the hole to penetrate the adjacent soil. Add water to the hole again until the water level is about 1 inch from the top.
2. Mark the starting water level with a small stick or an old pencil pushed into the side of the hole.
3. Record how far the water level drops at one-hour intervals and calculate an average infiltration rate in inches per hour. The rates may vary from minutes to hours per inch, so initially they should be checked frequently.

See the drainage test illustration and video on page 20. 

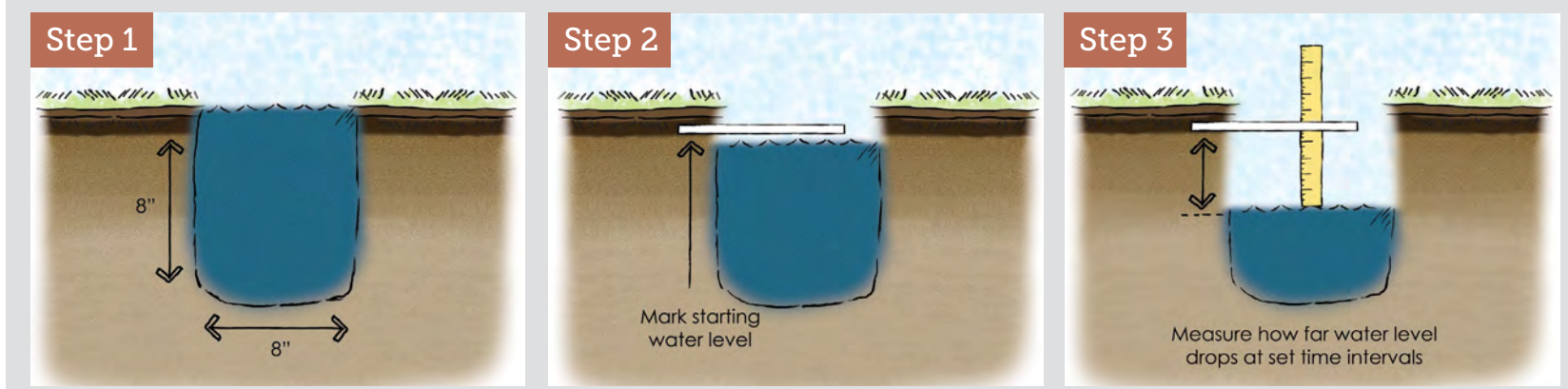
Once you have estimated the infiltration rate in inches per hour, multiply by 24 to get the rate per day to use as a design depth for the rain garden. Record your results in **Step 1B** on the **Design Size Worksheet**.

The slower the water infiltrates into the soil, the shallower your rain garden should be. This prevents plants from being flooded with water. If you are planning a large garden, the infiltration rate should be tested in several areas to confirm an accurate average rate.

Video | How to Test Soil Infiltration Rate



Illustration | How to Test Soil Infiltration Rate



Establishing Design Depth

A typical size for a residential rain garden holding area is 100 to 300 square feet.

The design area is the area of the rain garden bottom that is excavated and leveled. This area is where water is stored aboveground and should not exceed 300 square feet. Soil berms constructed to hold the water are not included in this size calculation, only the level, water holding area.

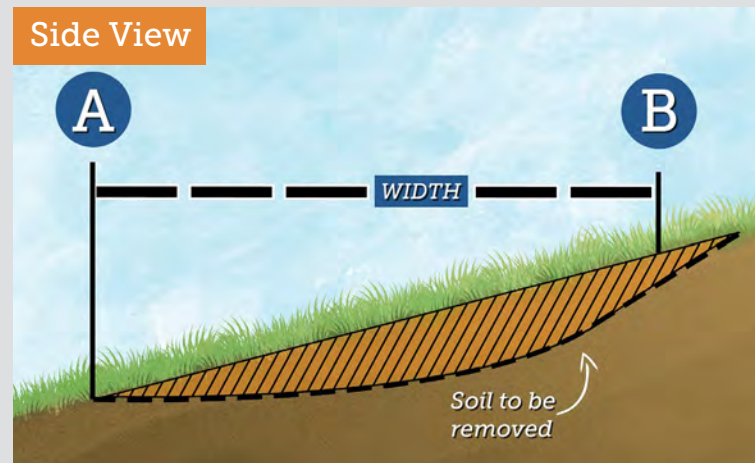
The design area is based on the amount of roof and other impervious area draining to the rain garden as well as the determined garden depth. The rain garden size recommendations provided here are based on capturing a typical 1-inch rainstorm. Also included are recommendations for designing based on a regional rainfall depth in Nebraska to capture 90 percent of rainfall, as shown in the [Design Size Worksheet](#).

Bird's Eye View



The design area includes the area between A and B. Soil berms (the brown outer edge) are not included in the design area calculation.

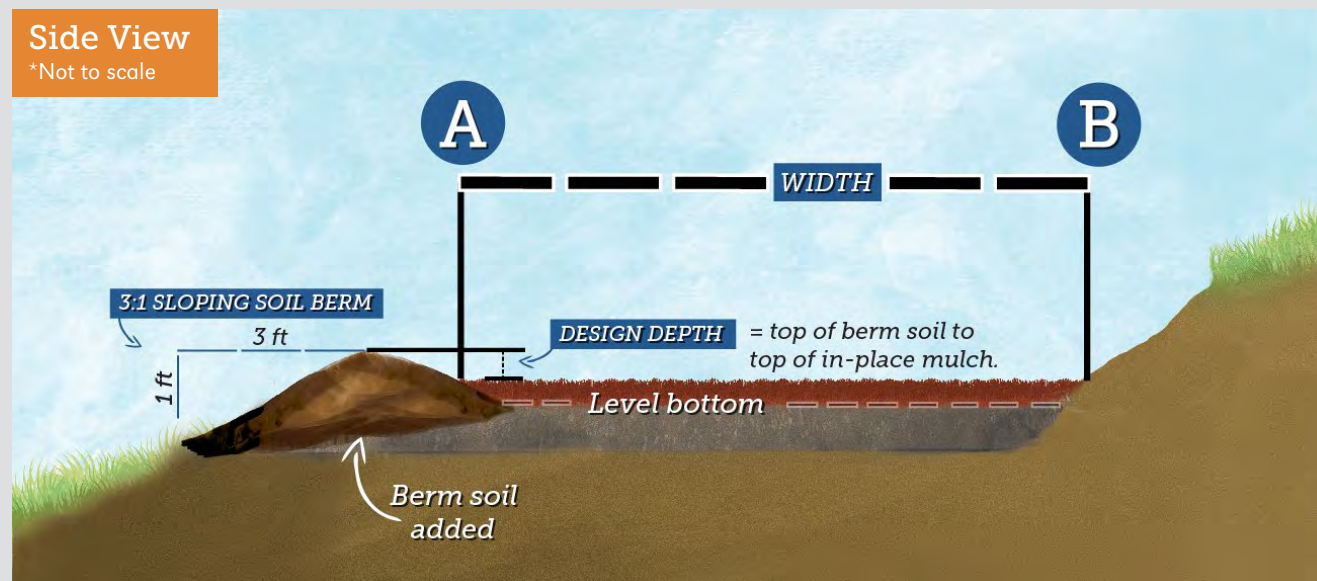
Side View



The area between A and B will be excavated and leveled. The area is determined by the calculations you'll complete on the [Design Size Worksheet](#).

Side View

*Not to scale



After the area between A and B has been excavated, the soil is compacted to create a level 3:1 sloping soil berm.

The depth for a rain garden can range from 4 to 8 inches.

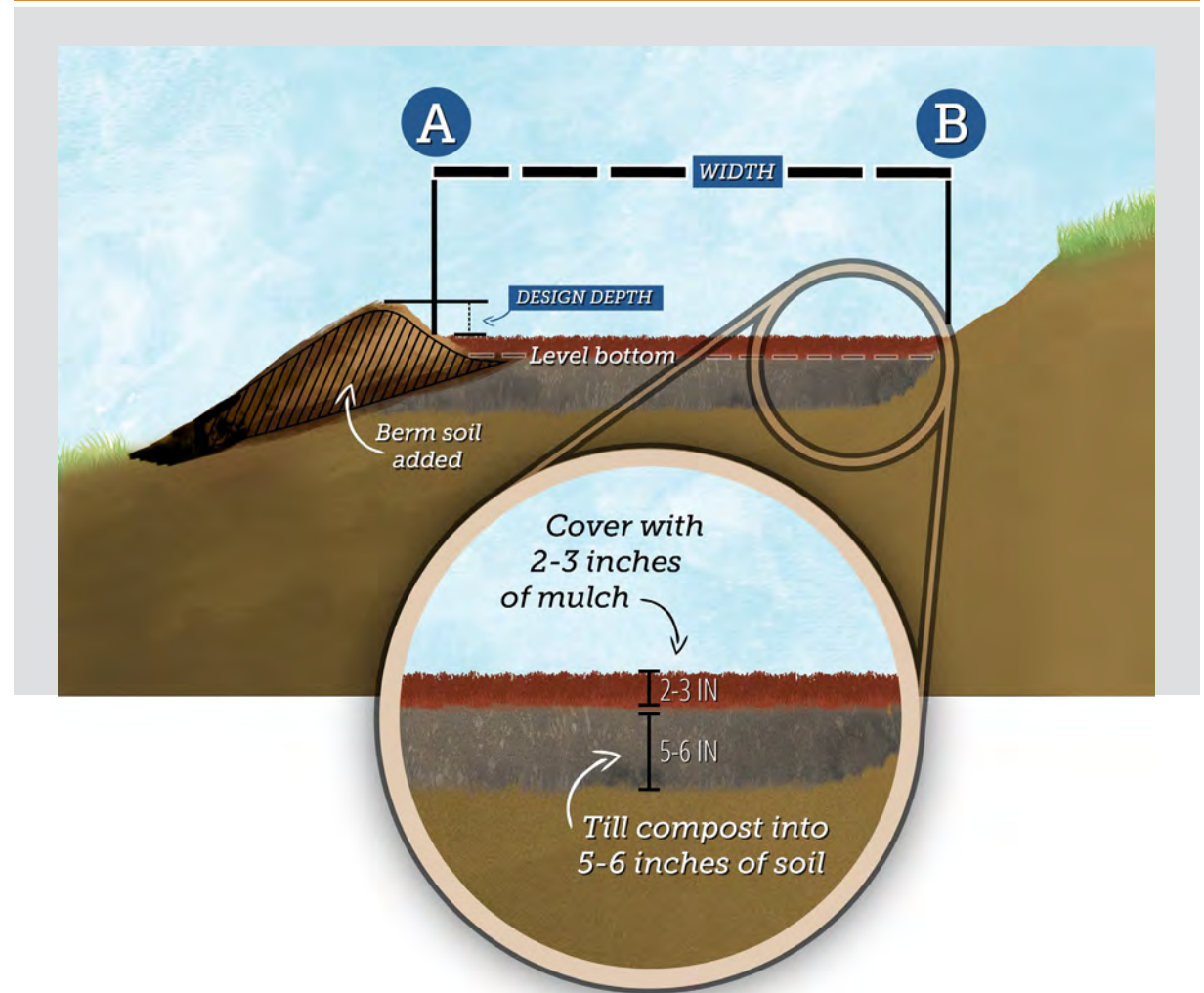
Although most rain gardens are 6 to 8 inches deep, they can be designed up to 12 inches deep if the infiltration rate is at least $\frac{1}{2}$ inch per hour so the garden will fully drain in 24 hours.

Gardens deeper than 12 inches will limit plant selection because many plants, especially when small, will not tolerate standing in 12 inches of water for up to a day.

A rain garden that is too shallow (2-3 inches) will need to be excessively large to provide enough water storage, which can increase the cost of the garden (including the number of plants required).

The bottom of the rain garden should be level, which will ensure good water distribution. For most locations, earth berms will need to be constructed to hold rainwater and to create a level bottom. Typically, soil dug from the upslope side of the site is used to create a downslope soil berm. Soil may need to be imported if enough is not available.

Establishing Design Depth: Close-up



▲ Graphic shows finished bed surface with 2-3 inches of mulch. Design depth is from mulch surface to top of soil berm.

Incorporating Inlets and Outlets into Your Rain Garden

Rainfall runoff can enter your garden as surface flow from a nearby downspout or through an underground pipe. It is also possible to direct water from higher areas of your yard into the rain garden with swales. In either case, a designated area of the garden where water enters (referred to as an inlet) should be protected from the force of water flowing into the garden.

Depending on the amount and force of the water, rock cobble, erosion matting, or other materials may be used to reinforce the area. An inlet may require some minor grading, or include aboveground swales or pipes, or underground pipes to route the water to the garden.

Excessive flow into the rain garden will occur during heavy rainfall. An outlet should be constructed with its elevation slightly below the elevation of the soil berms surrounding the garden to provide flow out of the garden on the downhill side. Place the outlet away from the garden inlet so it directs water to areas of the yard where it will be absorbed or flow safely away from the house to other landscape areas or the street.

Inlets and Outlets Slideshow

Click through the thumbnails above to view different examples of inlets and outlets to place at the edge of your rain garden.

If possible, overflow from the rain garden can be directed to a second, smaller rain garden or a water feature in the yard. In all cases, inlet and outlet locations should be carefully considered for each garden and be reinforced to withstand the accelerated flow of water at those points at the garden edge.

Rain gardens provide the most benefit when collected water infiltrates into the soil below the garden. For slow-draining landscape locations where a garden is still desired, an outlet drain consisting of a perforated pipe within a gravel trench can be installed under the rain garden to enhance drainage. Underdrain pipes can be complex to install and can significantly increase a garden's cost, so they should be carefully considered. A landscape professional is often the best option for designing and installing a garden underdrain system.

Other Solutions



An example of reinforcement for the overflow of a school rain garden site. When the garden fills, it will overflow on the gravel rocks and not damage the remainder of the berm that holds the water in the garden.



On slopes, it may be necessary to create a series of rain gardens that flow into one another as the higher gardens fill with water.

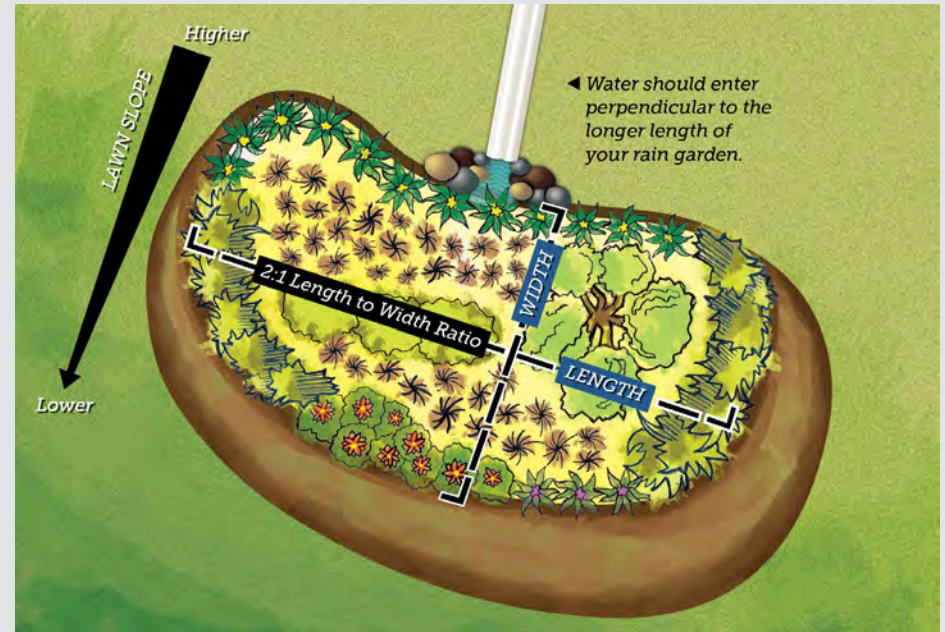
Step 6

Determine the shape and general appearance of the garden in the existing landscape.

Recommended Shape and Orientation

The shape of the rain garden should be dictated by the context of the garden location and the eye of the homeowner.

A shape such as a crescent, oval, teardrop, or kidney generally is more appealing than a rectangle. A shape that contains curves also fits better with the flow of curvilinear bed lines and plant groupings found in many residential landscapes. A general rule is to keep the ratio of length to width at least 2:1, with the longer length running perpendicular to the water entering the rain garden. This orientation maximizes the amount of water the rain garden can hold. The maximum width should not exceed 15 feet in landscapes with a slope of 8 percent or more.







Example of a typical kidney-shaped rain garden.

Additional Resources

After sizing and selecting your rain garden, the next step is to apply plant selection and design principles to ensure a beautiful, maintainable garden.




The next guide being developed for this series will focus on plant selection. Publication anticipated in 2014.

Until the release of the plant selection guide, please refer to the resources below for helpful information on plant selection and design principles.

- *Home Landscape: Understanding the Basics of Landscape Design (EC1254)*. University of Nebraska–Lincoln Extension, 32 pages. 
- *Nebraska Bioretention and Rain Garden Plants Guide (EC1261)*. University of Nebraska–Lincoln Extension, 64 pages. 
- *Stormwater Management: Installing Rain Gardens in Your Yard (G1760)*. University of Nebraska–Lincoln Extension, 4 pages. 
- Additional UNL Extension publications are available online at extension.unl.edu/publications. 



Additional Websites

- UNL Stormwater Management website at <http://water.unl.edu/web/propertydesign/home>. 
- UNL Rain Gardens for Homeowners at <http://water.unl.edu/web/landscapes/rain-gardens>. 
- UNL rain garden instructional videos on YouTube at <http://www.youtube.com/user/UNLRainGarden?feature=mhee>. 



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Rain Garden Site Selection and Sizing Guide

Design Size Worksheet

Step 1: Preparation

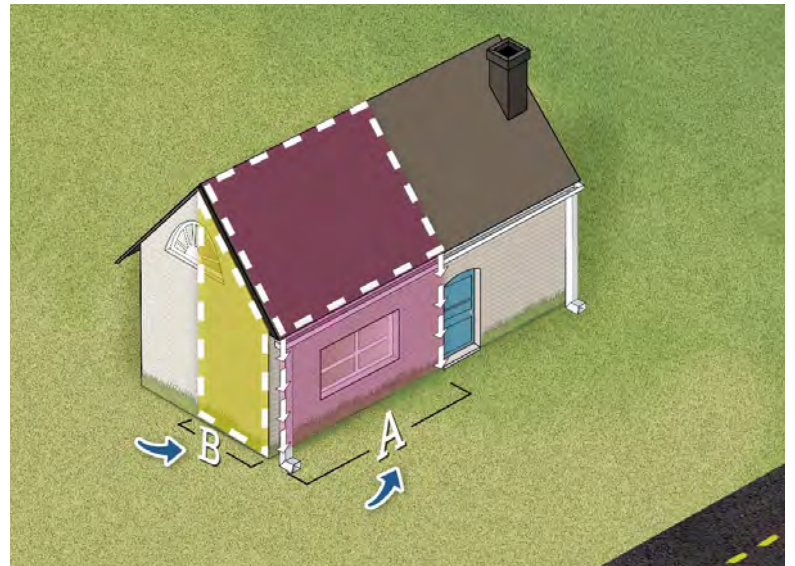
Collect the measurements referred to in the Site Selection and Sizing Guide (specific pages listed below in Steps 1A and 1B). If you're constructing more than one rain garden, you'll need to complete one worksheet per rain garden.

Step 1A Record drain area measurements from the roof that will contribute to the rain garden, and drain area measurements for any additional impervious surfaces that drain to the rain garden. **Refer to Page 12 in the Site Selection and Sizing Guide** for instructions and record your data below. Remember, length and width are measured along the ground. You may not have data for every row, and that's OK.

Drain Area	Length (feet)	Width (feet)
Roof Segment 1		
Roof Segment 2		
Roof Segment 3		
Roof Segment 4		
Triangular Roof Segment 1		
Triangular Roof Segment 2		
Triangular Roof Segment 3		
Impervious Area 1		
Impervious Area 2		
Impervious Area 3		

Step 1B Estimate your soil infiltration rate per day at the rain garden location by using the drain test on **Pages 19-20 of the Site Selection and Sizing Guide**. After conducting the test, record your data below. Don't forget to multiply your hourly rate by 24 to get your infiltration rate per day.

Enter infiltration rate per day: inches



Remember, length (A) and width (B) are measured along the ground.

Step 2: Calculate Drain Area

The measurements you recorded from **Step 1A** of this worksheet have been automatically added to the table below in order to calculate the contributing drain area. The calculations will tell you the total square footage that your rain garden drain area should be. The total will be at the bottom of the page.


Drain Area	Length (feet)	Width (feet)		Contributing Drain Area (square feet)
Roof Segment 1			→	
Roof Segment 2			→	
Roof Segment 3			→	
Roof Segment 4			→	
Triangular Roof Segment 1			→	
Triangular Roof Segment 2			→	
Triangular Roof Segment 3			→	
Impervious Area 1			→	
Impervious Area 2			→	
Impervious Area 3			→	

If you printed this worksheet out and you're completing your calculations manually, here are some helpful formulas to complete the tables above:

Roof Segment (rectangle):
Length x Width = Square Feet

Triangular Roof Segment:
(Length x Width) / 2 =
Square Feet

Impervious Area:
Length x Width = Square Feet



Drain Area:

(this will be automatically calculated once you enter measurements in the above table)

square feet

Step 3: Select Rain Garden Depth

Rain garden depth, which should range from 6 inches to 8 inches, is selected so that a rain garden filled with water will drain in 24 hours or less. Complete the steps below to find your rain garden depth.

Step 3A. Refer to the infiltration rate you recorded in **Step 1B** at the beginning of this worksheet.

Record that rate here: Your infiltration rate is inches per day.

Step 3B. Find which category your infiltration rate from **Step 3A** falls into below.

You may need to change your garden location based on the recommendations of your category.

Measured Infiltration Rate (per day)	Recommendation
Less than 6 inches	<p>If measured infiltration rate per day is less than 6 inches per day, then ANOTHER GARDEN LOCATION IS RECOMMENDED since infiltration is relatively poor.</p> <p>NOTE: If the garden location cannot be changed, and it will infiltrate 3-6 inches per day, then the garden depth can be set to the measured infiltration rate.</p> <p>NOTE: Shallow gardens will require significantly more area to construct and plant; shallow gardens also require accurate construction to maintain capacity.</p>
Between 6 and 8 inches	<p>This is the ideal category. If measured infiltration rate is between 6 inches and 8 inches per day, then set depth equal to infiltration rate.</p>
Greater than 8 inches	<p>If measured infiltration rate is greater than 8 inches per day, then set garden depth equal to infiltration rate UP TO A MAXIMUM DEPTH of 12 inches.</p> <p>NOTE: Gardens 8-12 inches deep may limit plant choices due to the increased potential for submerged plants.</p> <p>NOTE: Gardens deeper than 12 inches will require significant excavation and will limit plant selections due to the extended time for submerged plants.</p>

Step 3C. Your rain garden depth will be entered automatically below. Your depth will match your infiltration rate.

For example, if your infiltration rate is 6 inches per day, then your depth should be 6 inches.

Rain Garden Depth:

inches

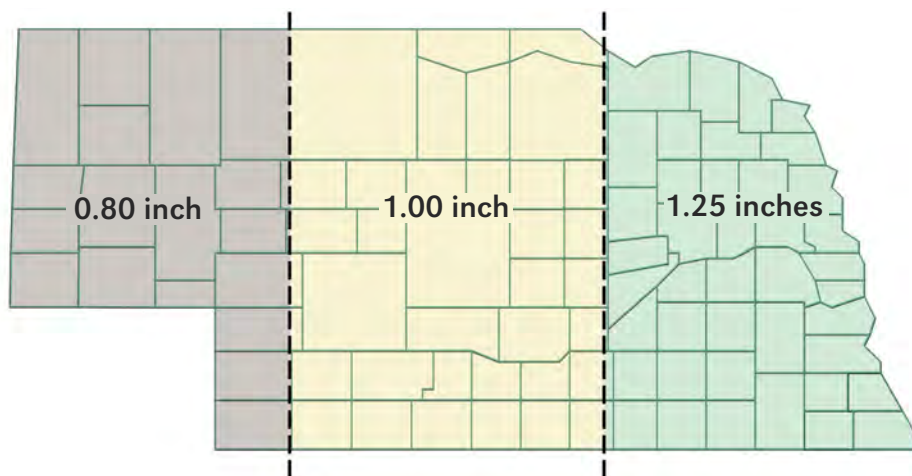
Step 4: Select Design Rainfall Depth

GUIDELINES

The design rainfall depth can be selected in one of two ways:

1. Use a standard recommendation of 1 inch. This means the rain garden will generally hold all water from a 1 inch rainfall, **or**
2. Select a regional rainfall depth that will capture approximately 90 percent of rainfall events.

Region	Design Rainfall Depth
Eastern third of Nebraska, 90% =	1.25 inches
Central third of Nebraska, 90% =	1.00 inch
Western third of Nebraska, 90% =	0.80 inch



Design
Rainfall Depth:

inches

Step 5. Compute Design Area

The design area is the area of the rain garden bottom that is excavated and leveled. This area is where water is stored aboveground and should not exceed 300 square feet. The volume of water stored is equal to the design area multiplied by the design depth. The form on this page computes the design area on the right once all data has been entered into the worksheet.

Drain Area <i>(from Step 2)</i>	<input type="text"/> square feet
Rain Garden Depth <i>(from Step 3)</i>	<input type="text"/> inches
Design Rainfall Depth <i>(from Step 4)</i>	<input type="text"/> inches

$\frac{(\text{Drain Area} \times \text{Design Rainfall Depth})}{\text{Rain Garden Depth}} =$	Design Area is: <input type="text"/> square feet <i>(round to nearest whole number, should not exceed 300 square feet)</i>
WHAT DO I DO WITH THIS RESULT? Create a rain garden shape with a water holding area equal to your recommended design area. This process is explained on the following three pages.	

WHAT IF MY DESIGN AREA EXCEEDS 300 SQUARE FEET?

It is fine to build a rain garden that has a different design area than the recommendations provided. However, it may be less functional in containing rainfall throughout the year if it is too small, and, depending on the depth, plants could suffer. Also, it will require extra, unnecessary soil movement and berm construction if it is designed too large. You may consider constructing two smaller rain gardens rather than one large garden. It is your choice. A small rain garden placed in a small urban lawn can still function and be a pleasant landscape feature even if it does not meet the depth and area recommendations suggested in this publication.

You can get assistance in designing your rain garden through your local Extension office or from UNL Extension specialists. Find additional information and contacts at the Extension Rain Garden website: <http://water.unl.edu/web/landscapes/rain-gardens>.

Step 6: Shape and Layout

After you've estimated the recommended design area of your rain garden, it's a good idea to outline your rain garden shape to get a good visual idea of how it fits into your yard. Shapes may vary, but should approximate a 2 to 1, length to width ratio. The water holding area should approximate the recommended design area from Step 5 of the Design Size worksheet. Account for berm area in your layout. Berms will extend beyond the design area.

GUIDELINES

When outlining your rain garden site in your yard:

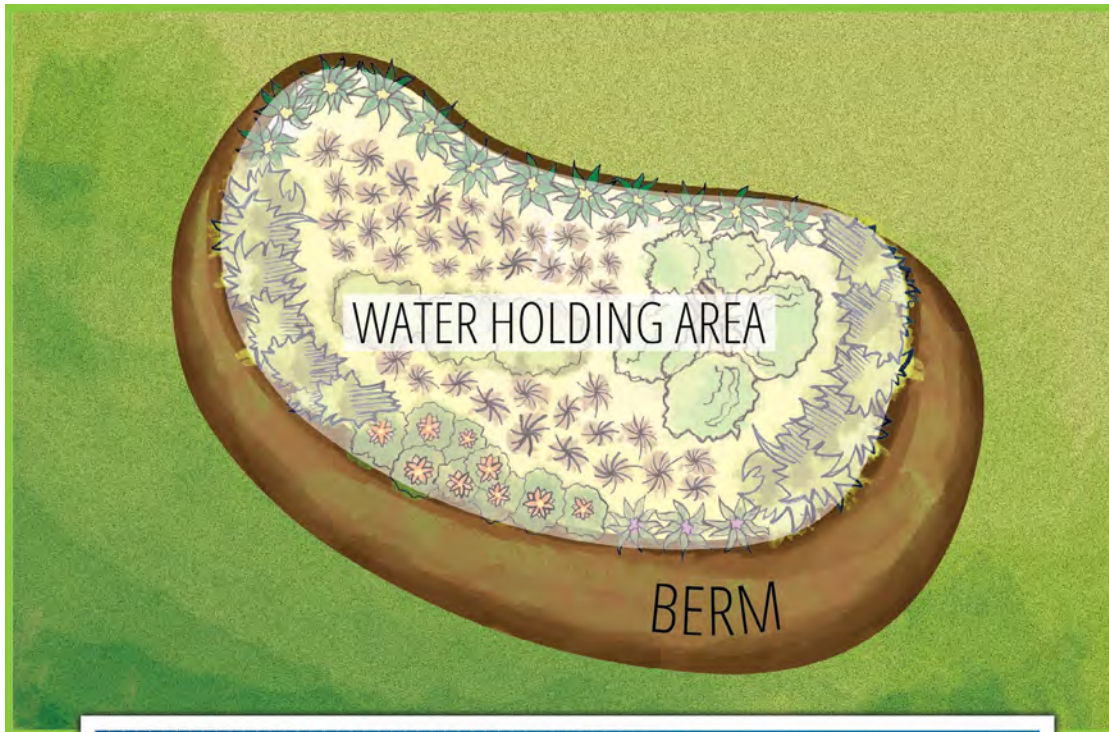
1. You could use small yard flags to outline your garden site.
2. Alternatively, you could use a garden hose to create the full outline of your garden.
3. Remember to account for the berm area as well when outlining your garden site.

Video | Outlining Your Rain Garden

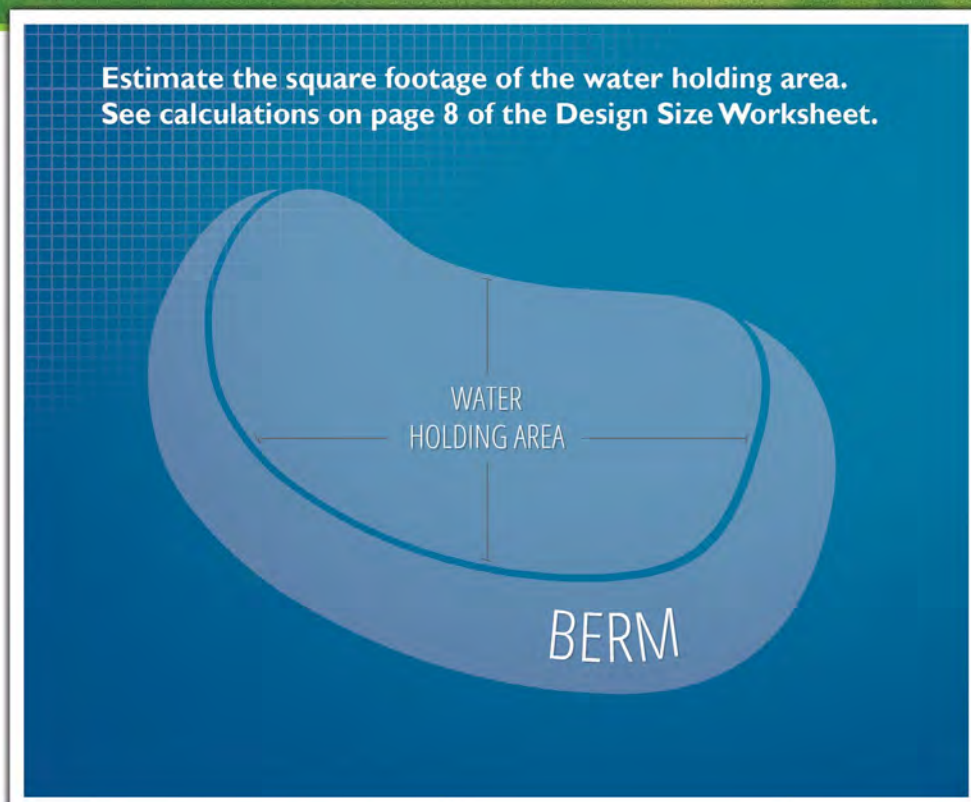


Step 6: Shape and Layout

Now that you know how many square feet your rain garden will occupy, you can lay out how it will be shaped in your yard. The total rain garden footprint includes the drainage area of the level bottom plus the area covered by the constructed berm (see illustration below).



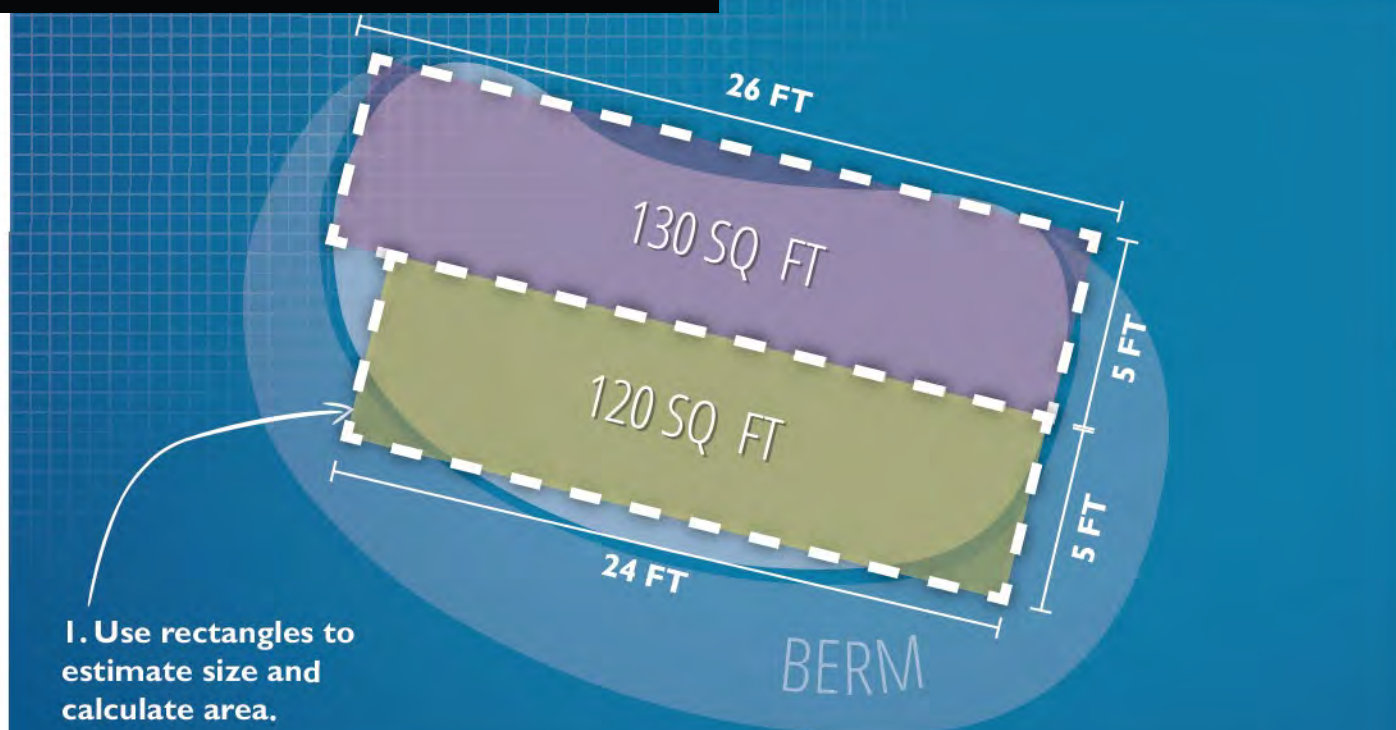
Estimate the square footage of the water holding area.
See calculations on page 8 of the Design Size Worksheet.



Step 6: Shape and Layout

Because rain gardens are typically unusual shapes (crescent or kidney-shaped), it is best to use rectangular and triangular shapes to estimate the shape of your berm and water holding areas.

HOW TO ESTIMATE YOUR WATER HOLDING AREA



Rectangles

LENGTH x WIDTH = AREA

$$26 \text{ FT} \times 5 \text{ FT} = 130 \text{ SQ FT} \quad 24 \text{ FT} \times 5 \text{ FT} = 120 \text{ SQ FT}$$

2. Add together both rectangle area measurements for total square footage

$$130 \text{ SQ FT} + 120 \text{ SQ FT} = 250 \text{ SQ FT WATER HOLDING AREA}$$

If your calculated area does not match the recommended design area, lay out a larger or smaller shape and repeat the calculations.

The constructed berm will add 3-4 feet of additional width along the downhill side of the design area. This area is not calculated in the example above, but needs to be accounted for in your final garden layout.