

# RAIN GARDEN ESSENTIALS

## Essential Steps

### A simple solution with a big effect

A rain garden is a shallow garden that captures water and soaks it into the ground. It fills up with the rain that falls on it – plus rainwater that runs off a hard surface like a roof or a driveway. It is a simple solution but it has a big effect.

The runoff water has picked up pollutants that the rain garden can filter out: phosphorus and nitrogen from fertilizers; bacteria from animal waste; oil, grease and heavy metals from cars, and just plain old “dirt” called sediment.

### Studies have shown rain gardens are effective at removing pollutants harmful to human health.

How? Sunlight destroys bacteria and viruses harmful to humans. Petroleum is eliminated by bacteria in the soil. Heavy metals are adsorbed by soil and mulch particles. This is in addition to those substances which are bad for the environment like nitrogen-containing compounds and phosphorous, at rates of over 90%.

Rain gardens require less watering than regular gardens during hot summer months. Because they capture water from the roof, a rain garden gets enough water that it doesn't need water from the tap. Your water bill can be reduced by using free water from the sky.

1. **Locate** where you will put the rain garden. Pick a location at least 15 feet from the house and downhill from the downspout.
2. **Measure** how big the roof/driveway/sidewalk that will drain to the rain garden is. Draw up a base plan. Call Miss Digg (811) to locate underground utilities.
3. **Size** the rain garden. Do the calculations so you know what size you are aiming for. The area of the depression should be 20-30% the size of the contributing roof or driveway.
4. **Design** the rain garden. Make a drawing that shows the size, shape, and plants.
5. **Plan the drainage.** Direct the water to your rain garden location, either overland or through a buried pipe.
6. **Dig** the rain garden. Dig a garden bed that will hold water 3-6” deep.
7. **Add soil amendments.** Rototill in compost, spread mulch.
8. **Plant** your rain garden with beautiful plants of your choice.
9. **Maintain** your garden so it looks great! Water your garden if it doesn't rain, until it is well established. Fertilizers aren't necessary but weeding is, especially at the beginning.



Photo of Roger Moon's Rain Garden. Designed & Installed by Roger Moon. Photo credit: Susan Bryan.

### Water Flows Downhill

Water flows down the gutter,  
into the downspout,  
downhill over the grass,  
and into the rain garden,  
Where it soaks into the ground.  
Beautiful!

Catch it before it runs onto the  
driveway and into the street!  
Once water is in the street, it picks  
up pollution before taking it to the  
nearest river.

Yuk!



# Locating

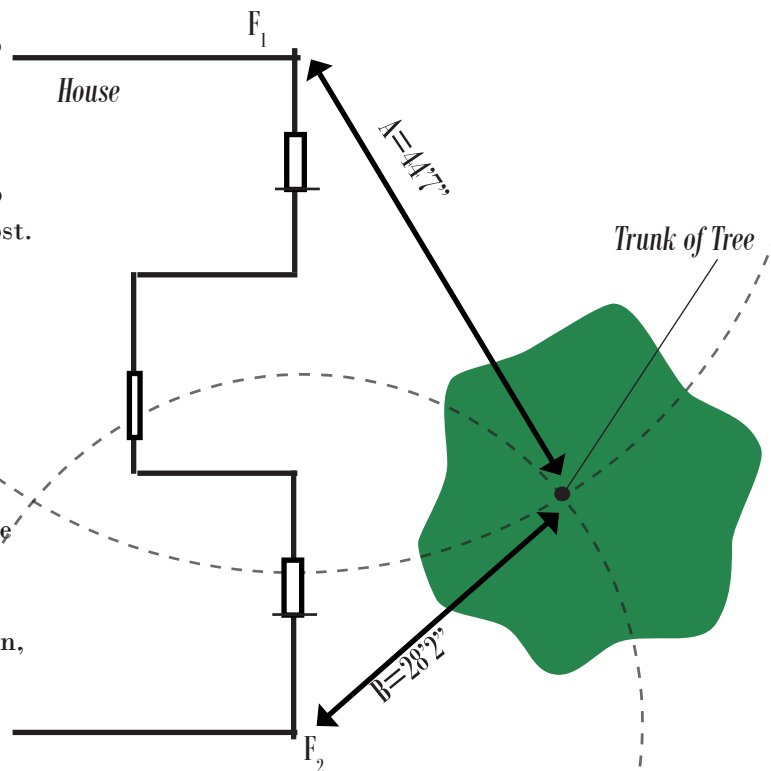
1. The garden must be at least 15 feet away from any building to prevent potential water seepage into the basement.
2. Select a spot that is flat or gently sloping and is downhill of the downspout. Avoid tree roots. Make sure overflow from the rain garden will go to a safe location, away from a building.
3. Do not place a rain garden over a septic tank, leach field or drinking water well.
4. Call Miss Dig at 811 at least three days before digging to avoid public pipes & utilities.
5. Avoid any private wiring or utilities such as driveway lights, sheds with electricity or lawn irrigation pipes.

# Measuring

Now that you have chosen a general location for the future rain garden, create a base plan that has all the elements that are currently on the site. This is so you can draw up a rain garden plan “to scale”. Include the house, trees, fences, sheds and bed lines that are near the future rain garden on the base plan. Being able to draw the rain garden plan “to scale” on an accurate base plan will help accurately estimate quantities of plants, mulch & compost. It is handy!

1. First start with a piece of graph paper. Each square on the paper might equal one square foot in the real world, depending on the size of your site. Make sure your graph paper is big enough to include your rain garden’s location. To do that, go outside and measure the space. Count the number of squares across your paper and make sure the plan will fit on the paper.
2. Measure the distance between two fixed spots. (Often, this is two corners of the house.) Draw them, on the graph paper to scale.
3. Start locating other objects in the yard, and draw them on your plan accurately (trees, fences, etc.) To do this, measure between both of the fixed spots, and the object. Sketch them on the plan in an approximate location, and write down the distances to each of the fixed spots. For example,  $A=44'7''$ ;  $B=28'2''$ .

4. Go back inside and using a string or compass that is measured to length, triangulate the exact location of the objects on the plan. Use the graph paper squares to make the string the first length that you measured (A). Holding one end of the string on the first fixed spot ( $F_1$ ), draw a semi-circle with the other end with the string the length you measured. Then use the graph paper to make the string the second length you measured (B). Holding one end of the string at the other fixed spot ( $F_2$ ), draw a semi-circle that crosses the first. Where the two circles cross is the location of the object. Erase the approximate location, and re-draw it in the exact location.
5. Repeat this process for fence ends, trees or other objects that will affect the location of the rain garden. Sketch in the approximate location of the future rain garden too.



Now you have a base plan on which to draw the shape of the rain garden.



# Sizing

1) Measure the length and width of the impervious surfaces (roof or driveway) that will flow to your rain garden. Multiply length time width to find the area in square feet.

2) Design the garden to be 4-9” deep and 10-30% the size of the impervious surfaces.

3) To figure out the exact size of your rain garden, first test your soil permeability by digging a hole that is the width of your shovel and 18” deep. Fill with water, wait until dry. Fill the hole again with water and time the rate of infiltration.

4) If your hole drains within 24 hours, then you will want your rain garden to be 10% the size of your hard surfaces and the depth to be between 4 and 9 inches. If the hole takes longer than 24 hours to drain, size it at 30% your impermeable surface area and a depth of 3-4”.

Time to Drain	Impermeable Multiplier	Depth in inches
within 24 hours	0.1	4-9
longer than 24 hours	0.3	3-4

## Example

If the impermeable surface draining into my rain garden is 750ft<sup>2</sup> and my test hole drains within 24 hours, the rain garden should be:

$$750 \times .1 = 75 \text{ square feet large}$$

for example, the dimensions could be 7.5’x5’ or 5’x15’

Since it drained within 24 hours, it should be: 4-9 inches deep\*

\* You will have to dig your garden two inches deeper than the final elevation to allow for added compost.

5) On your base plan, since one grid box equals one foot, you can count the boxes in the outlined garden to see how many square feet your rain garden is. Count up the boxes in your sketched garden to see if you are making it big enough.

If there isn’t enough space on your property for the needed area, or if long term maintenance isn’t possible in such a large garden, it is acceptable to make the rain garden smaller. Every little bit helps!

### Can’t Get Outside to Measure or Test Soil?

You can use the Interactive Map WashCo to measure your impervious surface by entering your address in the search bar on the top right.

[mapwashtenaw.washtenaw.org](http://mapwashtenaw.washtenaw.org)

You can also find out your soil type by scrolling down on the left hand “Identify Results” section to select the NRCA Hydrologic soils layer.





# Design

1) Draw a rain garden outline on the base plan you just made. Make it any shape you like. Draw in the berm, if you are digging on a slope, on the downslope sides (see page 19 for more information). The berm can take up a surprising amount of room, especially on steeper sites. Make sure you will only be changing the grade of your property, not the grade of your neighbor's property. The rain garden should be at least 2 feet away from the property line.

2) Make sure there is at least ten feet between any structure with a basement (for instance your house, or your neighbor's house) to the rain garden.

3) Make the garden a pleasing shape that goes with the rest of the garden.

4) Count up the grid boxes in the designed rain garden (not including the berm) to see how many square feet the rain garden is. Are you in the ballpark of the number of square feet you calculated? If not, revise a bit.

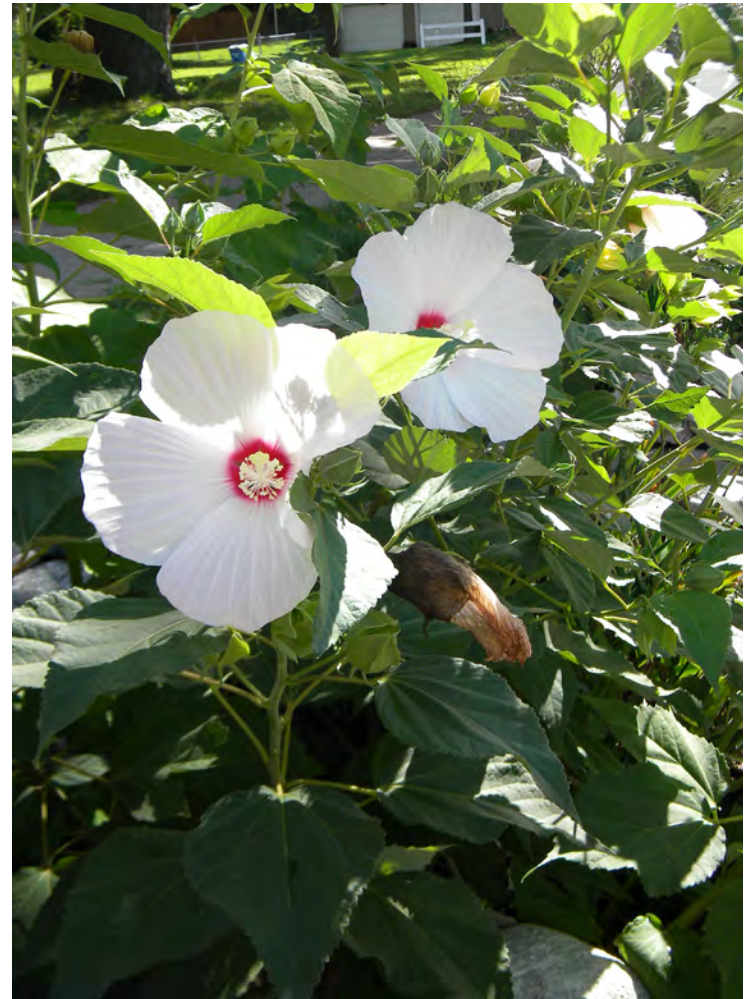
5) Decide how water will get to the rain garden: overland swale or underground pipe. More information is on page 18. Draw the path and type of conveyance on the drawing.

6) Select a rainwater overflow outlet location for when the garden fills up and spills over. Make sure it flows away from any buildings and to a safe place.

7) Select plants. Plants for the sides and bottom of the rain garden should include those adapted to the extremes of wet and dry conditions. Plants for the berm should be adapted to dry conditions. See the suggested plant list on page 21.

8) Consider the height, bloom time, sun requirements and color to create a garden you will like.

9) Include some personalized details. A defined border can make the garden look polished. Including stepping stones or stumps can be fun for kids to play on. These are useful for perching on to weed from too. Buy some labels for the new plants so you can identify them when you are weeding.



*Miller Ave Rain Gardens in Ann Arbor. Design by Susan Bryan & Chris Carson.*

*Installed by Hoffman Brothers and Chapman's Nursery in 2013. These gardens capture runoff from the street & are maintained by volunteers. Rose Mallow, pictured.*



# Sample design: part shade

Black-eyed Susan  
*Rudbeckia hirta*  
part sun-part shade  
height 2-3'  
spread 1-1.5'  
Blooms July-Sept



- Coral Bells
- Virginia Waterleaf
- Early Meadow Rue
- Blazing Star
- Obedient Plant
- Starry Soloman's Seal
- Black-eyed Susan

- Blue-eyed Grass
- Canada Anemone
- Blue Flag Iris
- Blue Lobelia
- Blue Lobelia
- Gray's Sedge

- Spiderwort
- Wild Geranium
- Slender Mountain Mint
- Wild Geranium
- Celandine Poppy
- Nodding Wild Onion

# Sample design: full shade

Wild Geranium  
*Geranium maculatum*  
full sun-part shade  
height 1.5-2'  
spread 1-1.5'  
Blooms April-July



- Pennsylvania sedge
- Wild Geranium

- Common Lilac
- Swamp Milkweed

- Blue Flag Iris
- Prairie Dock

Photo credit: Jonathan Kittel



# Sample design: part shade

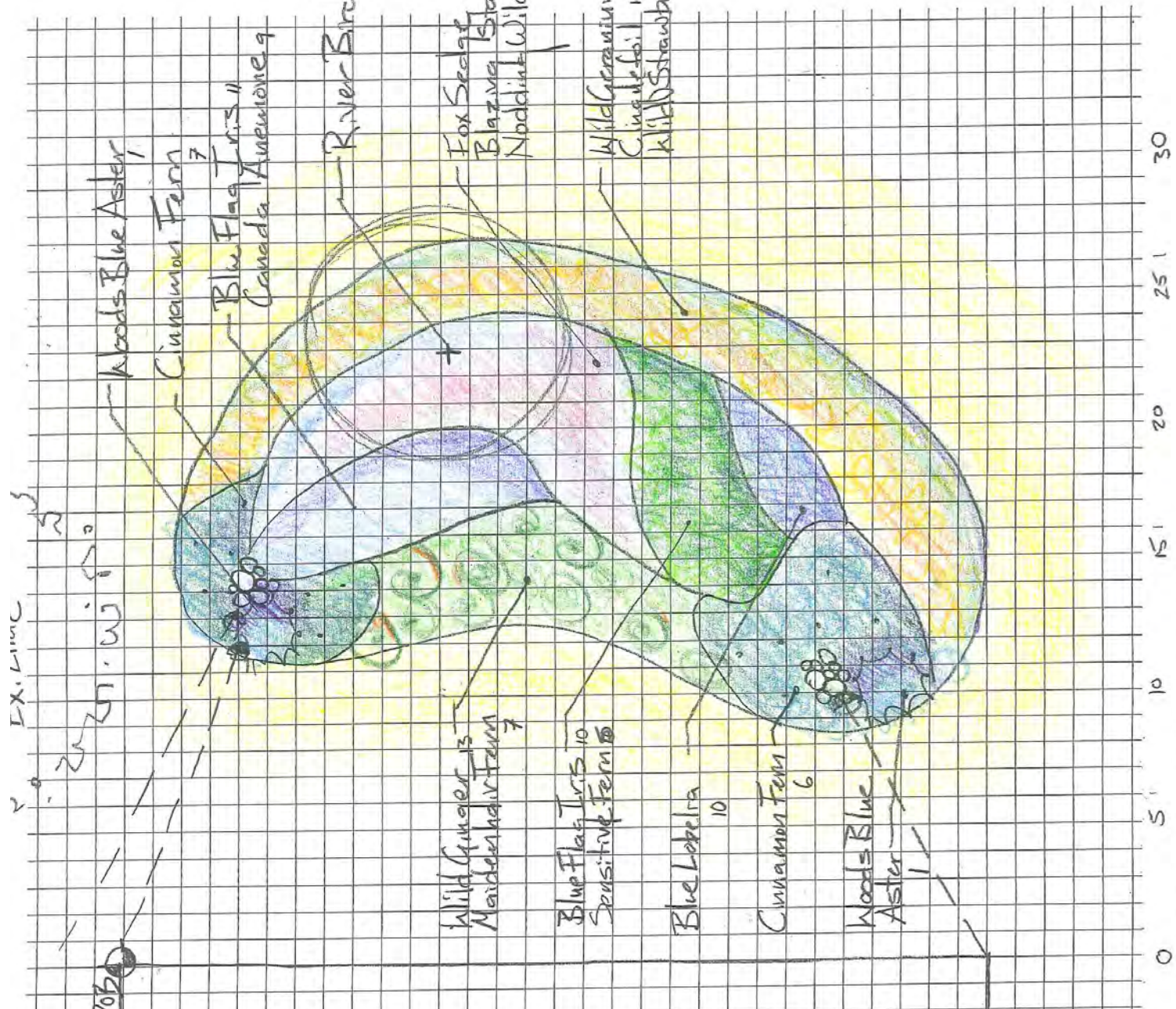
## LEGEND



Point of Beginning



Stormwater Conveyance from Roof



## NOTES

1. Drawing is completed to the accuracy of the base information. Slight modifications may be necessary during installation.
2. Plants are subject to nursery availability. Substitutions may be made.



North

12 weeks  
BEFORE YOU DIG  
CALL MISS DIG  
800-482-7171  
Miss. Inc.

OWNER is responsible to field verify location of all underground utilities prior to any work



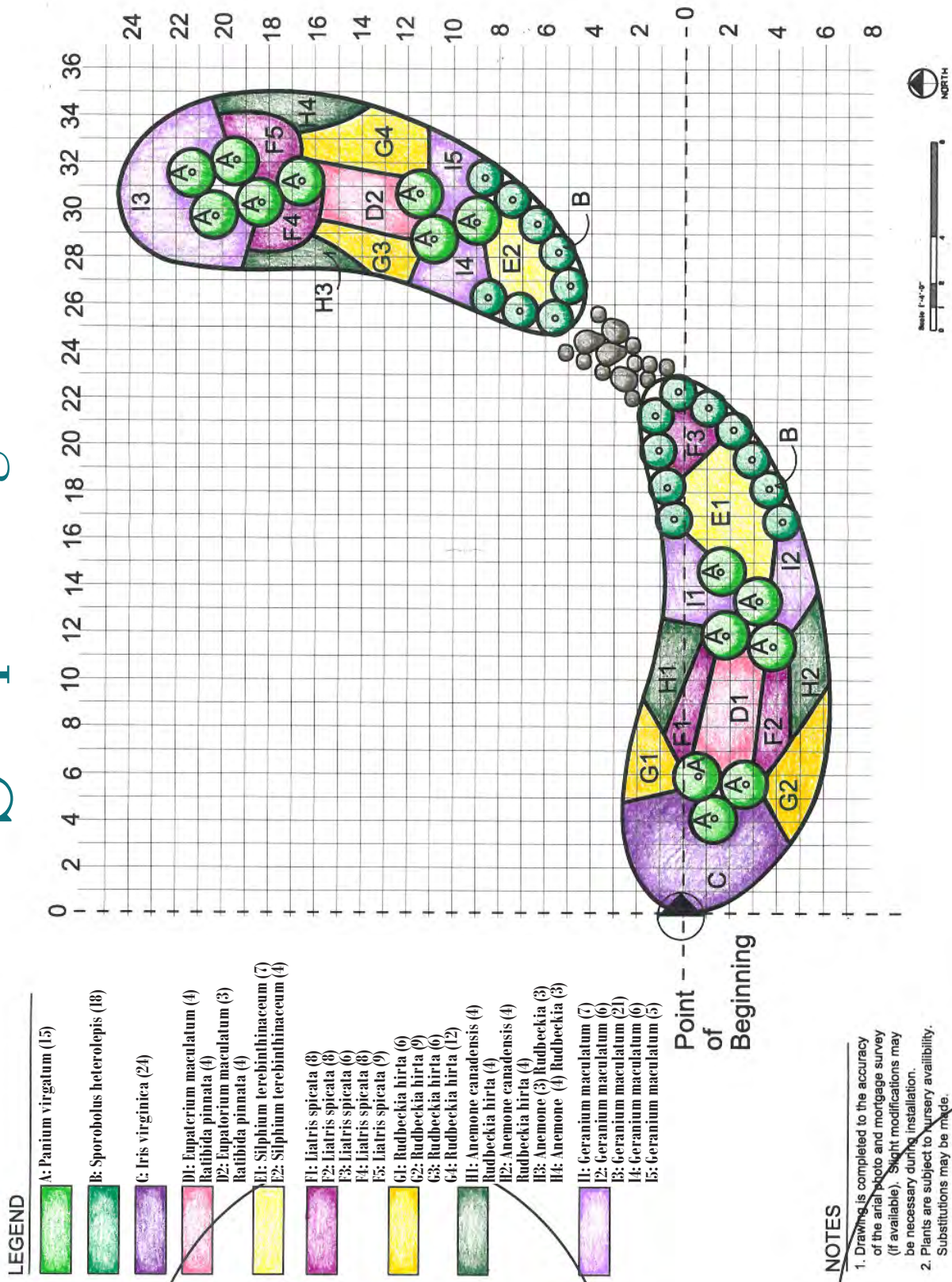
Design by Susan Bryan for Kim Wheeler



# Sample design: full sun

IN SITE

Project:  
Washtenaw County  
Rain Gardens  
Geddes Lake  
3000 Lakehaven Dr.  
Ann Arbor, MI



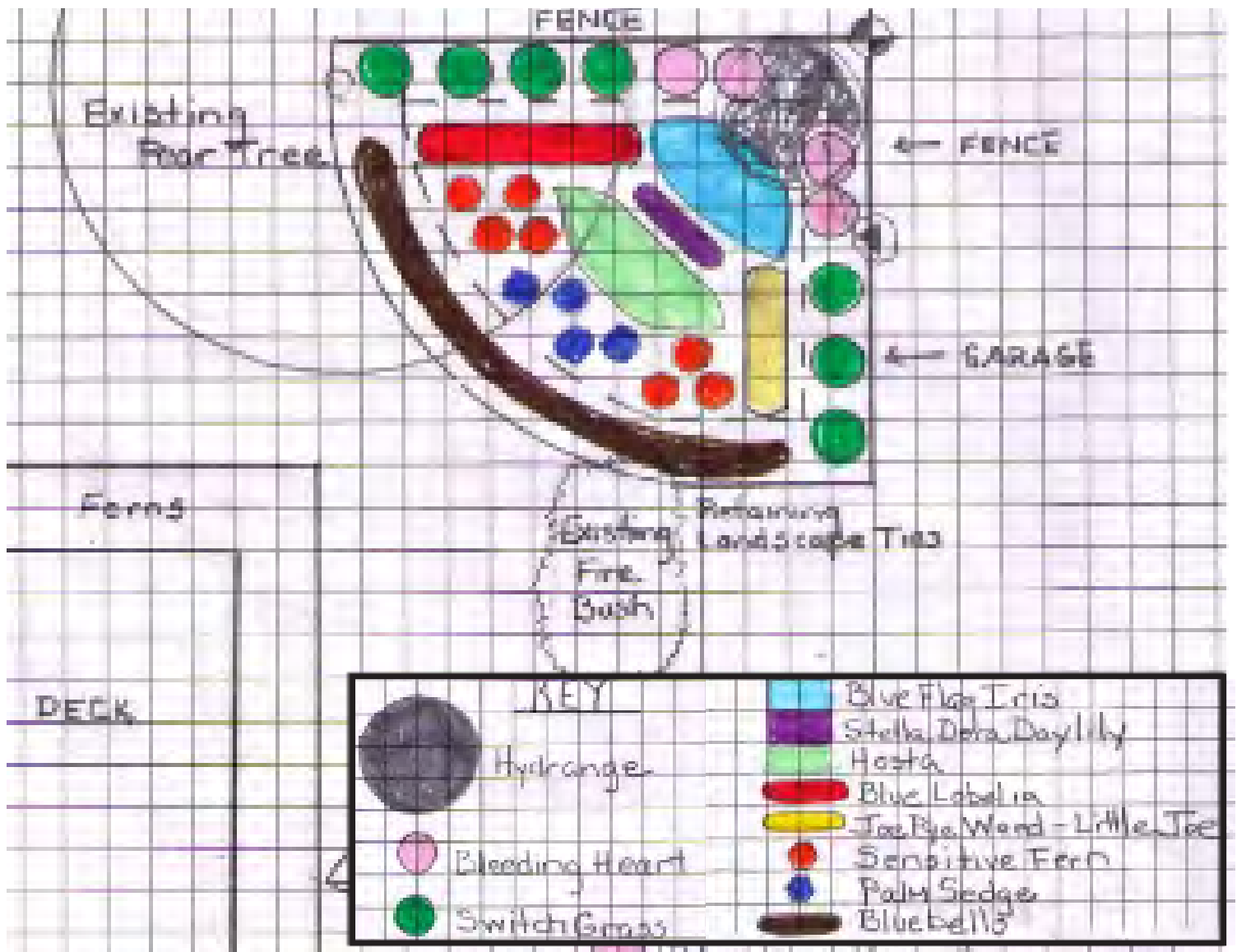


Photo credit: Sallie Richie



Photo credit: Susan Bryan

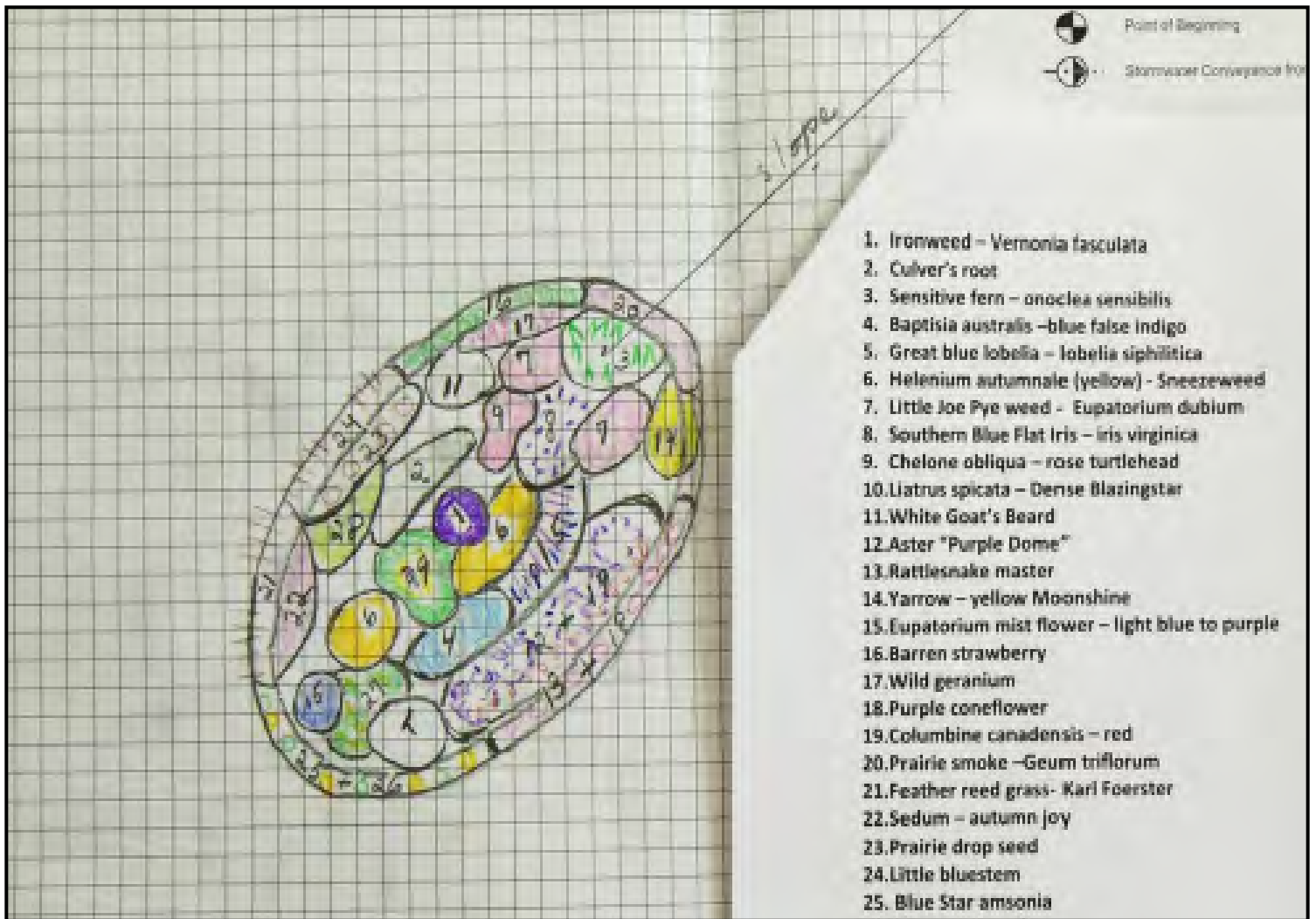
## Sample design: part shade

Top: Master Rain Gardener, Sallie Richie's design

Left: Yard before rain garden construction

Right: Completed rain garden with Master Rain Gardener, Sallie Richie





## Sample design: full sun

Top: Master Rain Gardener, Helen Prussian's design and plant list

Bottom Left: Yard before rain garden construction. Footprints in snow outline rain garden border.

Bottom Right: Completed rain garden with Master Rain Gardener, Helen Prussian



Photo credit: Helen Prussian



Photo credit: Susan Bryan



1



# Transfer your drawing to your site

1) Translate the dimensions of your rain garden onto the ground by first laying out tape measures that act like the grid paper.

2) Draw the edge of the garden on the ground by placing flags in the measured locations from your 'point of beginning'.

3) Paint the garden border on the grass with spray paint, or use lime or string.

4) Rototill sod, use a sod-cutter, or kill the grass by laying down cardboard and mulch.

5) Dig a shallow depression with a level bottom.

6) With the soil dug out to create the depression, build a berm on the downhill side to hold the water within the garden like a bowl.

7) Add a notch to the downslope berm for overflow water to go to a safe location. The notch will determine the water depth within the rain garden.

2



3



*Photo credits: Harry Sheehan*



# Drainage

## With an Underground Pipe

- 1) Sometimes it is necessary to direct water to the rain garden underground with a pipe. The pipe will need to run downhill to the rain garden.
- 2) The pipe should outlet above where the water will pool. The emergency overflow notch will be below the elevation of the bottom of the pipe. This way water won't sit in the pipe.
- 3) Use a non-perforated pipe with a 4" diameter. Either corrugated black plastic or PVC works. Don't use perforated pipe near the house. PVC is better for long runs (>20'), but is more expensive.
- 4) The end of the pipe can end with a grate (shown) or with a pop-up.
- 5) Place a few stones where the pipe outlets in the garden to reduce erosion.



Rain garden in Dexter, Michigan. Photo credit: Susan Bryan

# Drainage

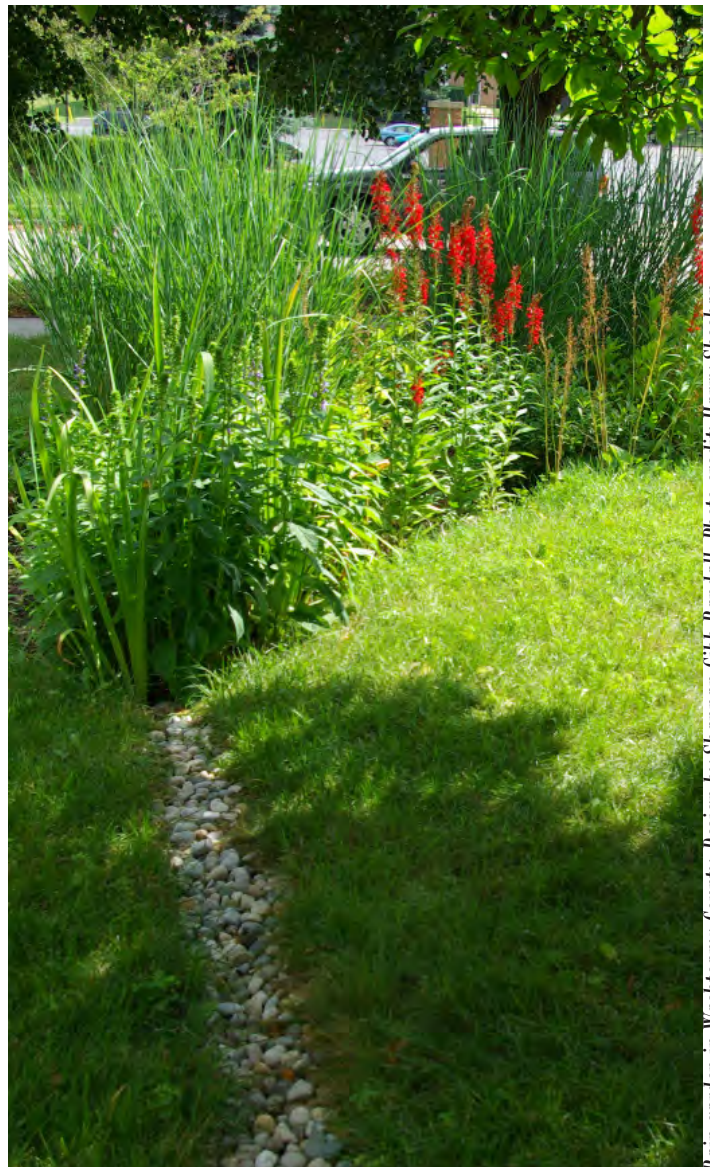
## Over Land

- 1) Water will run overland to your rain garden if it is downhill from your downspout to your rain garden. Check with a hose to make sure water will flow there.
- 2) Often water will infiltrate into the ground while moving along the channel.
- 3) Your drainage channel can be made of stones, native plants or simply be a lowered grassy pathway.



Rain Garden by Don Schwartz & KC Runciman Landscapes.

Photo credit: Susan Bryan

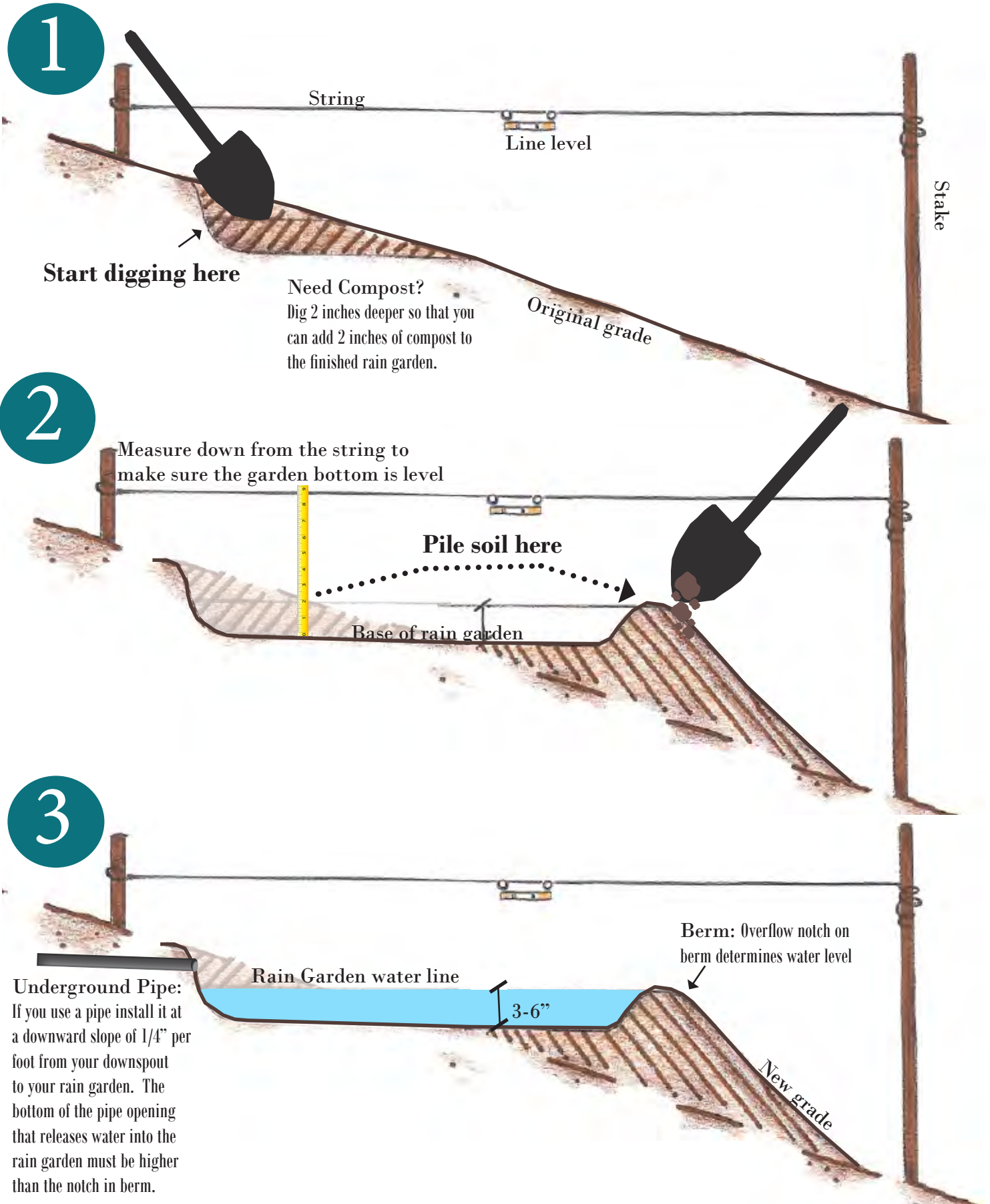


Rain garden in Washtenaw County. Design by Shannan Gibb Randall. Photo credit: Harry Sheehan





# Digging the Rain Garden





# Soil Amendments

1) Dig the rain garden 2 inches deeper than the final intended depth, reserving the topsoil on a tarp. Is there any topsoil left in the hole? If not, dig another 6" and replace with the topsoil you just dug out. Leave it 2" deeper than final depth, to make room for the compost.

2) Lay 2 inches of compost down in the rain garden bottom & sides. Till compost into soil and then cover with 2 inches of hardwood shredded mulch.

3) How many cubic yards of mulch and compost do you need? Determine how much compost and mulch is required to cover the garden with the following calculation:

$$(A * 0.00617) = \text{material in cubic yards}$$

where A = area in square feet of garden. This can be calculated by counting the squares on your base plan drawing

Calculation can be used for either compost or mulch material and is for depths of 2".

# Planting

If you have plants in your garden that are adapted to both wet & dry conditions, you can transplant them into the rain garden. If you are buying plants, it is recommended to buy plants in pots because seeds are often washed away. Live plants have root systems that can resist the movement of water.

To Plant: dig a hole deep enough that the roots can hang vertically. If the roots are root-bound, break them up. Place the plant deep enough so that the entire root ball is covered but the base of the stem is above the soil. Fill the hole and pat firmly to remove any air space.

Too wet to plant? Place the mulch first. Mulch can soak up some water, and make it less muddy. Don't worry - the plants like it wet.

Watering: Keep soil around plants moist for a few weeks and in times of drought. When to water? Test the soil by sticking your finger into the soil. If your fingertip touches moist, but not soaked soil, you are watering the correct amount.























Rain garden at Eastern Michigan University housing. Design by SGR. Photo credit: Shannan Gibb-Randall.



# RAIN GARDEN PLANTS

These are the top twenty Michigan plants used successfully in Washtenaw County rain gardens. The first two rows (in blue) should be planted on the sides of your rain garden, where it is moist. The bottom three rows (in green) should be planted on the bottom of your rain garden, where it is the most wet.

<b>New england aster</b> <i>Aster novae-angliae</i>  LBJ wildflower center Blooms: September - October	<b>Canada anemone</b> <i>Anemone canadensis</i>  Bransford, W.D. and Dolphia Blooms: May - June	<b>Wild geranium</b> <i>Geranium maculatum</i>  LBJ wildflower center Blooms: May - June	<b>Goldstrum black-eyed susan</b> <i>Rudbeckia fulgida</i>  LBJ wildflower center Blooms: July - September
<b>Ninebark</b> <i>Physocarpus opulifolius</i>  Bloodworth, Stefan Blooms: May - July	<b>Redbud</b> <i>Cercis canadensis</i>  LBJ wildflower center Blooms: May	<b>Wild strawberry</b> <i>Fragaria virginiana</i>  LBJ wildflower center Blooms: May - June	<b>Kobold blazing star</b> <i>Liatris spicata</i>  Julie Makin Blooms: July
<b>Purple coneflower</b> <i>Echinacea purpurea</i>  LBJ wildflower center Blooms: July - August	<b>Switch grass</b> <i>Panicum virgatum</i>  LBJ wildflower center Blooms: September - October	<b>Nodding wild onion</b> <i>Allium cernuum</i>  LBJ wildflower center Blooms: September - October	<b>Ostrich fern</b> <i>Meteuuccia struthiopteris</i>  LBJ wildflower center Blooms: September - October
<b>Goldfinger potentilla</b> <i>Potentilla fruticosa</i>  LBJ wildflower center Blooms: June - July	<b>Fox sedge</b> <i>Carex vulpinoidea</i>  LBJ wildflower center Blooms: May - June	<b>Red-osier dogwood</b> <i>Geranium maculatum</i>  Garden Photos Blooms: May - June	<b>Rose Mallow</b> <i>Hibiscus moscheutos</i>  LBJ wildflower center Blooms: August - September
<b>Pink turtlehead</b> <i>Chelone lyonii</i>  LBJ wildflower center Blooms: August - September	<b>Sensitive fern</b> <i>Onoclea sensibilis</i>  LBJ wildflower center Blooms: July - September	<b>Blue lobelia</b> <i>Lobelia siphilitica</i>  LBJ wildflower center Blooms: July - September	<b>Blue flag iris</b> <i>Iris virginica</i>  Mahoneys Garden Blooms: May - June

**Legend** ☀ full sun ☁ part sun ● aggressive spreader