# Royal Oak Rain Garden Program:

## DIY Residential Rain Garden Guidebook

September 2018

Royal Oak

# Table of Contents



Front cover photo credit-Rachel Yamakura

# Introduction

## Background

In most towns and cities, rainfall and snow melt are whisked away into an engineered stormwater system of pipes and basins that funnel water, unfiltered, directly into local streams & rivers.

After its trip through the pipes, stormwater is no longer just rainwater. It can become warmer as it runs over hot pavement. Stormwater is polluted with nutrients, bacteria, sediment, and other hazardous substances it picks up along the way. Due to large amounts of stormwater, a small creek can flow like a river after a rainfall, eroding the banks and muddying the river.

The polluted runoff poisons fish, plants and other species that depend on clean water.

Woods and prairies historically soaked up almost all of the rain that fell on them. Conversely, concrete soaks in almost none.

People play, boat, and fish in the river and if the contamination levels are too high, restrictions can be placed on recreational activities, such as swimming and fishing. Stormwater is the number one source of pollution in rivers today.

There is a simple way to do your part in order to keep pollution out of the river, reduce flooding, recharge the water table, and revitalize your yard: build a rain garden.

**Rain Gardens**

Rain gardens help protect our nearby water bodies by filtering and soaking water back into the ground. For a 1,500 square foot home on a 50'X100' lot, approximately 2,000 gallons of water from a one-inch rain storm runs off of roofs, driveways, patios, and even lawns.

A simple, low-maintenance rain garden can capture much of that runoff, similar to how the natural environment would function. Learn how you can mimic nature's effects by following this DIY guide to building rain gardens.

## Clinton River Watershed Council

The Clinton River Watershed Council (CRWC) has worked for more than 45 years with citizens, businesses, community groups and local governments throughout the watershed, including communities along Lake St. Clair, to implement land use practices that protect our water resources and enhance the economic vitality of our communities.

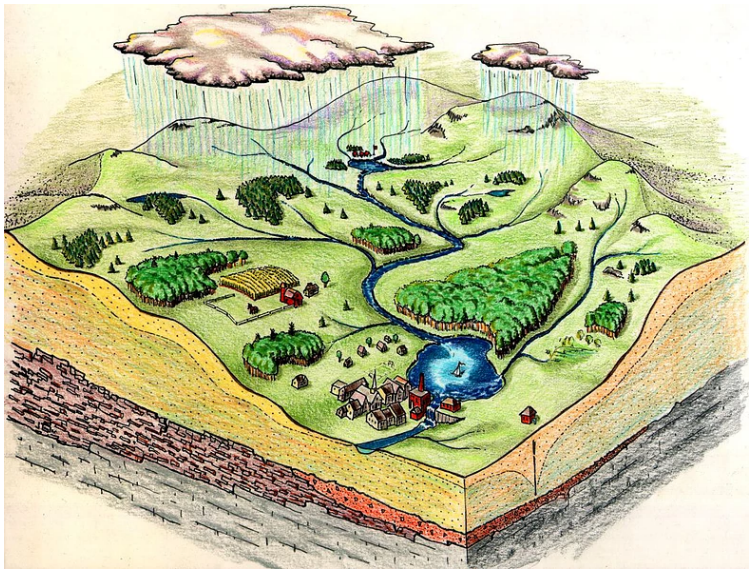
Our work focuses on innovative watershed management techniques, including controlling stormwater runoff, protecting open space, wetlands, and stream corridors, reducing erosion and sedimentation, restoring streambanks, and improving habitat for fish and wildlife.

WaterTowns™ is our place-making initiative designed to promote green infrastructure, including rain gardens, and help communities leverage the natural assets of the Clinton River and Lake St. Clair for water-oriented community and economic development.

We also provide educational programs to help people learn and understand more about their role in protecting clean water—at home and at work. Topics include native landscaping, rain gardens, lawn care tips, and safer ways to fertilize or clean, among others.

We are proud partners with the City of Royal Oak in their efforts to promote rain gardens in your community.

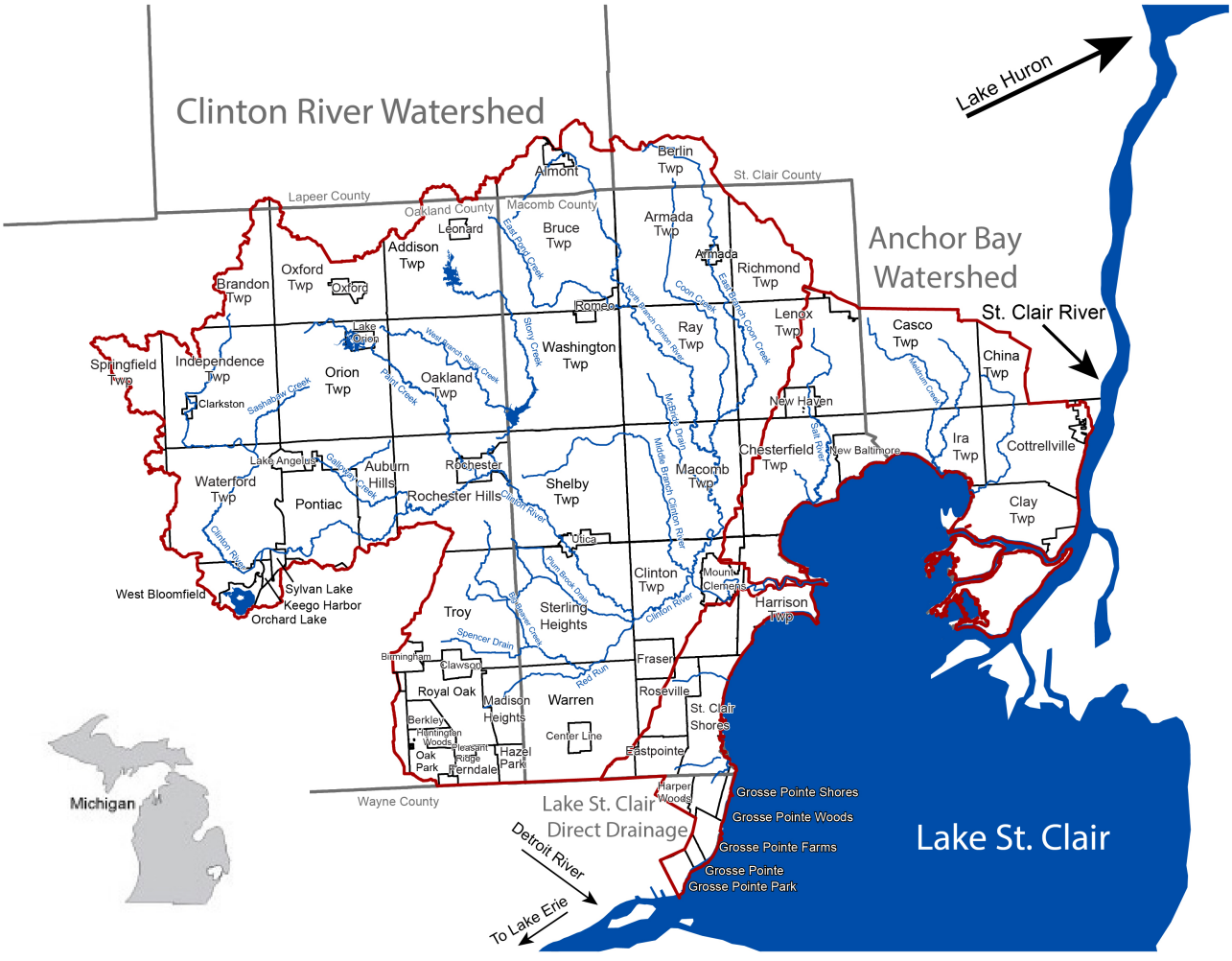
# Watersheds



What's a watershed? It's an area of land that all drains to a common point, such as a river, lake or stream. The City of Royal Oak is in the Clinton River watershed, which eventually drains into Lake St. Clair.

There are many nonprofits and citizen groups that work to protect the Clinton River and its watershed. Through the Clinton River Watershed Council, you can participate in river and park cleanups and work days, become a citizen scientist by participating in aquatic insect monitoring, or take an on-line class to learn how to make your landscaping more river-friendly through our River Safe-Lake Safe Program, among other things. Visit the Clinton River Watershed Council at **www.crwc.org for more information**

## Clinton River Watershed



# Public rain gardens

Are you excited to participate in a rain garden creation or in maintenance but do not have a location at your home that will work?

Please contact Julie Lyons Bricker at julieb@romi.gov or 248-246-3202 to see if there are volunteering opportunities to help create new or maintain current city rain gardens.

Ongoing maintenance is a constant with rain gardens, so volunteering at an existing public rain garden is appreciated and time well spent! Rain gardens need to have weeding done, new plants planted, and established plants divided.

*Main Street Rain Garden, Royal Oak*

## Royal Oak Public Rain Gardens

### City Development:

**Fourth Street Boulevard Gardens (Between Blair and Connecticut) - 2018**
Installed four large rain gardens to capture rain runoff from both sides of Fourth Street.

**Vinsetta Boulevard (at N. Washington Avenue) – 2016**
The city has installed an infiltration rain garden within the road median. This area experienced significant surface flooding during extreme wet weather events.

**Worden Park Parking Lot (Lexington Boulevard and Crooks Road) – 2016**
The city installed an infiltration rain garden within the city parking lot.

**Eagle Plaza (W. Fourth Street and S. Center Street) – 2016**
The city installed a bio-retention cell as part of a city parking lot replacement project

**S. Main Street (10 Mile Road to Lincoln Avenue) – 2016**
The city installed six bio-retention cells between the roadway and sidewalk as part of a federally funded road resurfacing and streetscape project.

**Grant Park Parking Lot (E. Fourth Street and Kayser Avenue) – 2015**
The city installed an infiltration rain garden within public right-of-way adjacent to a new boulevard median parking lot.

### Private Development:

**Kroger Store (12 Mile Road and Stephenson Highway) – 2016**
The developer has installed an infiltration rain garden in addition to code required detention system.

**11 Mile Condominiums (11 Mile Road and Maxwell Avenue) – 2016**
The developer installed an infiltration rain garden to capture 50% of required stormwater volume, in addition to an underground stormwater detention system that to captures 75% of the required stormwater volume for a total of 125% storage.

### Other Ideas:

There are many other public rain gardens that could use your help! Find a garden near your home or ask us for more ideas.

# Rain Garden Essentials

## Description

A rain garden is a shallow saucer-shaped garden that soaks rainwater 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, also known as stormwater. It is a simple solution that can have a big impact.

The stormwater 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. Sunlight destroys bacteria and viruses harmful to humans, petroleum is eliminated by bacteria in the soil, and heavy metals are absorbed by soil and mulch particles. This is in addition to those substances which are bad for the environment like nitrogen-containing compounds and phosphorous.

Plants in rain gardens require less watering 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.

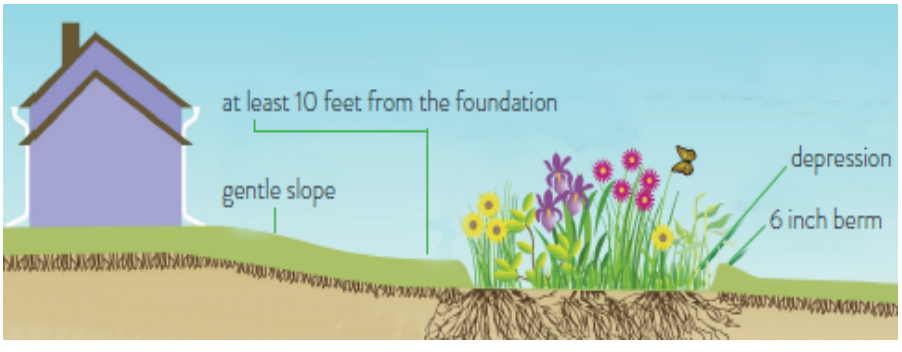
## Locating

- The garden must be at least 10' away from any building to prevent potential water seepage into the foundation.
- Select a naturally low spot that is flat or gently sloping and is downhill of the downspout and foundations.
- Make sure overflow from the garden will go to a safe location, away from any structures.
- Rain gardens should not be built on steep slopes.
- Avoid tree roots.
- Rain garden must be 100' from a septic field and at least 50' from a water well, sloped away from building.
- Call Miss Dig at 811 at least three days before digging to avoid public pipes and utilities.
- Avoid any private wiring or utilities, such as driveway lights, sheds with electricity, or lawn irrigation pipes.

**TOOLS**

- ☐ Tape Measure
- ☐ Shovels
- ☐ Rakes
- ☐ Trowels
- ☐ Line Level
- ☐ String
- ☐ Wooden stakes
- ☐ Small backhoe

or rototiller (optional)

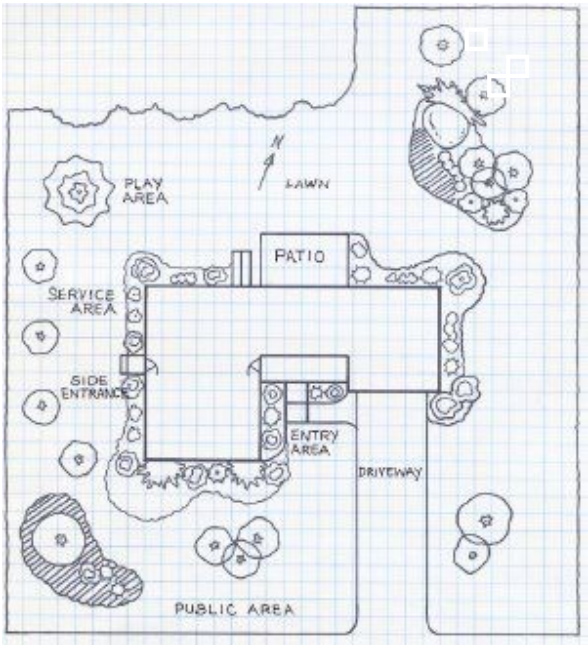



CONTACT 811 BEFORE YOU DIG
811
SAFE DIGGING PARTNER

# Measuring

Now that you have chosen a general location for the rain garden, create a base plan that has all the elements that are currently on the site. Include the house, trees, fences, sheds and bed lines that are near the future rain garden in 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 and compost.

1) First start with a piece of graph paper located in the back of the guidebook. 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 and make sure the plan will fit on the paper.
2) Next, measure the distance between two fixed spots. (Often, this is two corners of the house.) Using the graph paper, draw them to scale.
3) Start locating other objects in the yard (trees, fences, etc.). To do this, measure the difference between all the fixed spots. Sketch them in on the plan in an approximate location.
4) Then, lightly 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.




# Determining slope

1) Pound a stake in at the uphill end of your rain garden site and another at the downhill end. The stakes should be about 12 to 15 feet apart. Make sure the downhill stake is tall enough so that a level string can be run between the stakes.

2) Tie a string at the bottom of the uphill stake and extend it to the downhill stake.

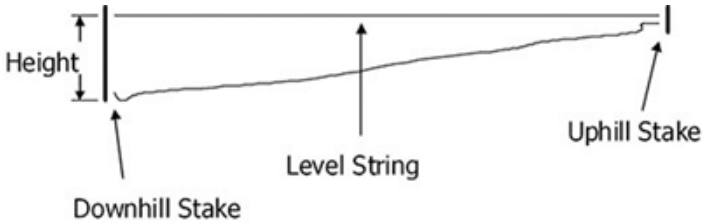
3) Using a string level (inexpensive and available at most hardware stores) or a carpenter's level, level the string and tie it to the downhill stake. If using a carpenter's level use the longest one you have—short ones are more difficult to use over long distances.

4) Measure the width (in inches) between the two stakes. Now measure the height (in inches) on the downhill stake between the ground and string.

5) Divide the height by the width and multiply the result by 100 to find the lawn's percent slope.

**Garden Depth Guidelines:**

If the slope is between 0 and 4%, it is easiest to build a 3-5" deep rain garden.
If the slope is between 5 and 7%, it is easiest to build a 6-7" deep rain garden.
If the slope is between 8 and 12%, it is easiest to build an 8" deep rain garden.
If greater than 12%, find a different location or consider other storm water management techniques.
**Carry this rain garden depth number to next page for sizing guidelines for your garden.**




**Example:** If in the above illustration, the stakes are 15 feet (180 inches) apart and the string is 11 inches above the ground on the downhill stake, the slope of the yard is 11/180 times 100, which is about 6%. From the guidelines to the left, we see that our garden should be 6-7" in depth.


# Sizing guidelines

1) **Runoff area**-Measure the length and width of the impervious surfaces (roof or driveway) that will flow to your rain garden. Multiply the length times the width to find the area in square feet. (Example above = 50' X 15' =750 sq. ft.)
2) **Soil percolation**-Test the percolation of the soil by digging a hole that is about 6" in diameter (post-hole digger size) and 18" deep. Fill with water, wait until it is completely drained. (Should drain within 24 hrs. or site may not be suitable for a rain garden without a sub-drain installation) Fill the hole again with 12" of water and time the rate of infiltration.
3) **Determine multiplier**-Using Tables 1 and 2, take the infiltration rate from the percolation test to determine which basic soil type you have and then move across to the proper depth column based on your previous slope measurement. This is the"multiplier".
4) **Calculate size of garden**-Take runoff sq. ft. number from #1 and multiply it by the above "multiplier". This should be the approximate size of your garden.

Table 1

| Drains within: | Infiltration Rate is: |
|---|---|
| 6 hr. | 2.00"/hr. |
| 12 hr. | 1.00"/hr. |
| 18 hr. | .75"/hr. |
| 24 hr. | .50"/hr. |

Table 2

| | | Sizing Multiplier | | |
|---|---|---|---|---|
| Infiltration Rate | Soil Type | 3-5" deep | 6-7" deep | 8" deep |
| >1.25"/hr. | Sandy Soil | .19 | .15 | .08 |
| .75-1.00"/hr. | Silty Soil | .34 | .25 | .16 |
| .25-.50"/hr. | Clayey Soil | .43 | .32 | .20 |

**Calculation example**-
John's yard slope is 5%, so his garden should be 6-7" deep*. (Page 7)
John's percolation test showed that 12" of water drained fully in 16 hr., so his infiltration rate is between .75-1.00"/hr.
Using Table 2, his multiplier is .25.
Multiply .25 by his run-off area, 50' X 15'.
**His approximate garden size should be 750 sq. ft. X .25= 187.5 sq. ft. and 6" deep*.** (actually 8" deep to make room for compost mixture. See page 17.)

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!

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

# Designing

1) Now that you know the approximate size for the rain garden, draw an outline on the base plan you just made. Make it any shape you like. Draw in the berm.(see page 18 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 10' 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 your landscaping.
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.
5) Decide how water will get to the rain garden: overland swale or underground pipe. More information is on page 16. 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) Create the garden design by choosing the varieties of plants you want and draw them into your plan. Plants for the sides and bottom of the rain garden should include those adapted to the extremes of dry and wet conditions, respectively. Plants for the berm should be adapted to dry conditions. Consider the plants' height, bloom time, sun requirements, and color. See the suggested plant list on page 20 and in the sample designs on pages 10-14.
8) Include some personalized details. A defined border can make the garden look polished. Including stepping stones, small boulders, 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.

*Top: Vinsetta Blvd. Rain Gardens in Royal Oak. These gardens capture runoff from the street & are maintained by the city. Bottom: Rose Mallow in a rain garden*

# 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

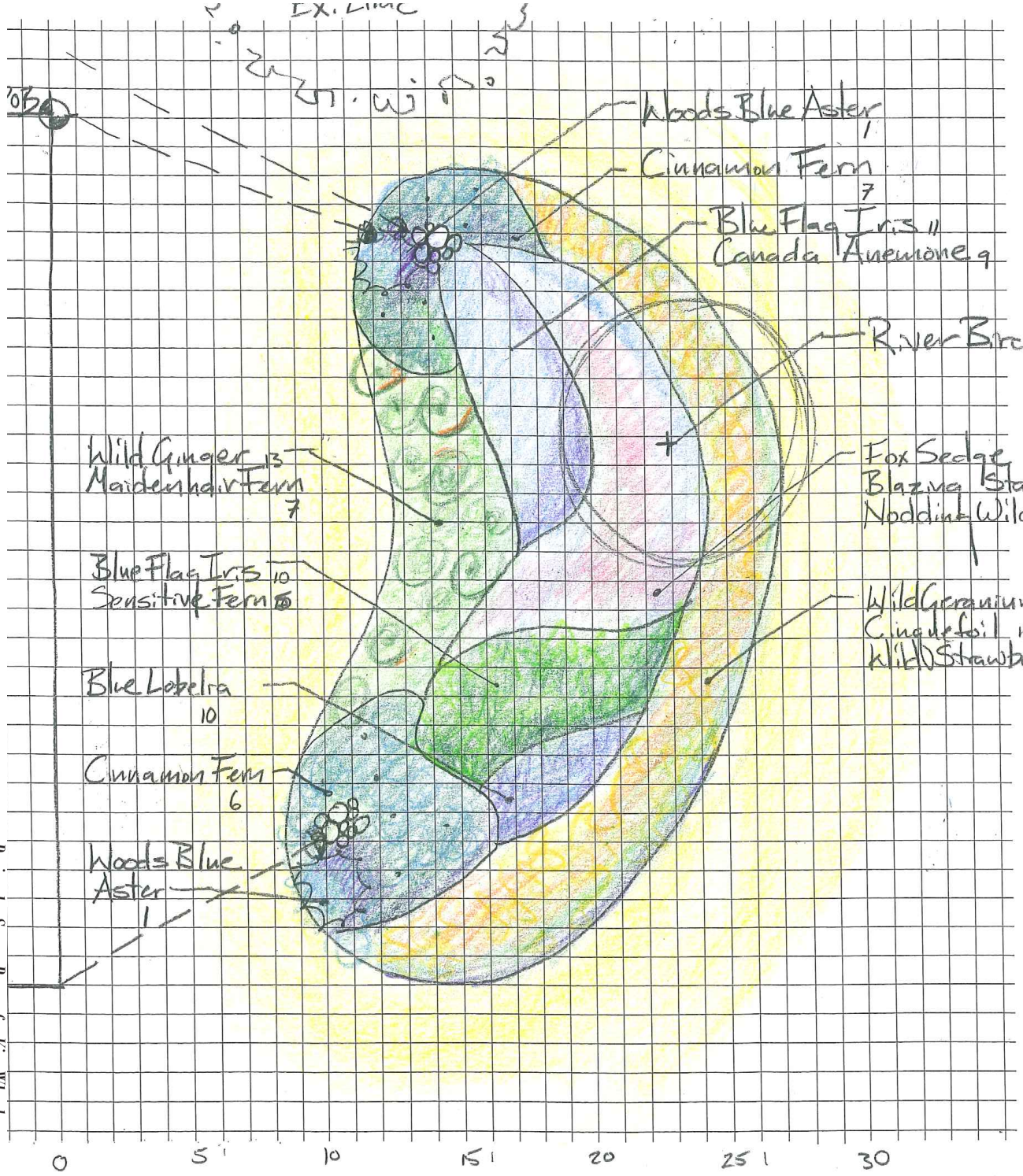
Wild Geranium
*Geranium maculatum*
full sun-part shade
height 1.5-2' spread 1-1.5' Blooms April-July

*Photo credit: Jonathan Kittel*

- Pennsylvania sedge
- Wild Geranium
- Common Lilac
- Swamp Milkweed
- Blue Flag Iris
- Prairie Dock

INSITE

# Sample design: part shade




Design by Susan Bryan for Kim Wheeler

## 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 availibility. Substitutions may be made.

North

72 HOURS
BEFORE YOU DIG
CALL MISS DIG
800-482-7171
(TOLL FREE)

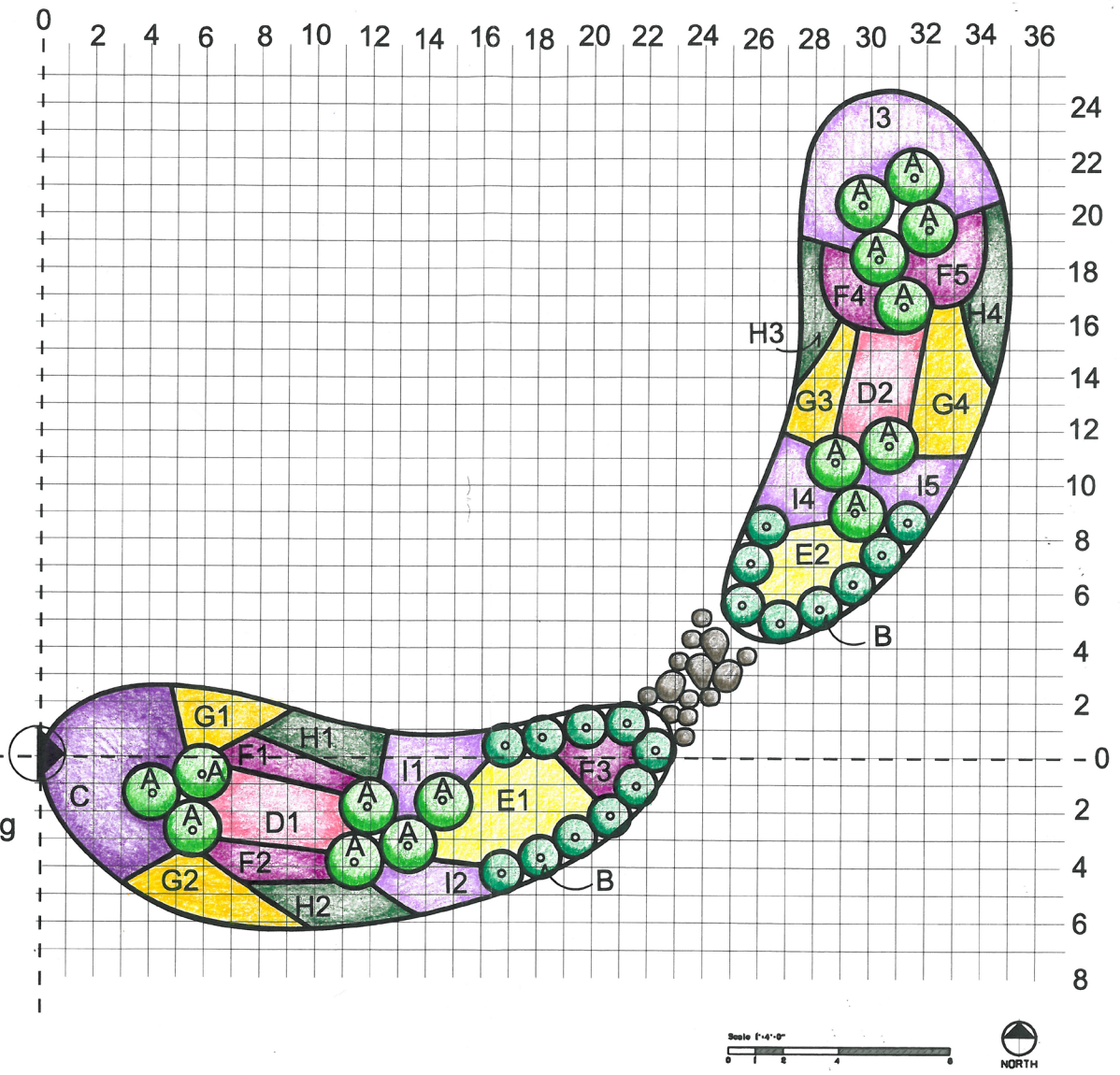
OWNER is responsible to field verify location of all underground utilities prior to any work

Scale 1"=4'-0"
0 1 2 4 8

INSITE

## LEGEND

- A: Panium virgatum (15)
- B: Sporobolus heterolepis (18)
- C: Iris virginica (24)
- D1: Eupatorium maculatum (4) Ratibida pinnata (4)
- D2: Eupatorium maculatum (3) Ratibida pinnata (4)
- E1: Silphium terebinthinaceum (7)
- E2: Silphium terebinthinaceum (4)
- F1: Liatris spicata (8)
- F2: Liatris spicata (8)
- F3: Liatris spicata (6)
- F4: Liatris spicata (8)
- F5: Liatris spicata (9)
- G1: Rudbeckia hirta (6)
- G2: Rudbeckia hirta (9)
- G3: Rudbeckia hirta (6)
- G4: Rudbeckia hirta (12)
- H1: Anemone canadensis (4) Rudbeckia hirta (4)
- H2: Anemone canadensis (4) Rudbeckia hirta (4)
- H3: Anemone (3) Rudbeckia (3)
- H4: Anemone (4) Rudbeckia (3)
- I1: Geranium maculatum (7)
- I2: Geranium maculatum (6)
- I3: Geranium maculatum (21)
- I4: Geranium maculatum (6)
- I5: Geranium maculatum (5)




## NOTES

1. Drawing is completed to the accuracy of the arial photo and mortgage survey (if available). Slight modifications may be necessary during installation.
2. Plants are subject to nursery availibility. Substitutions may be made.

Sample design: full sun

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

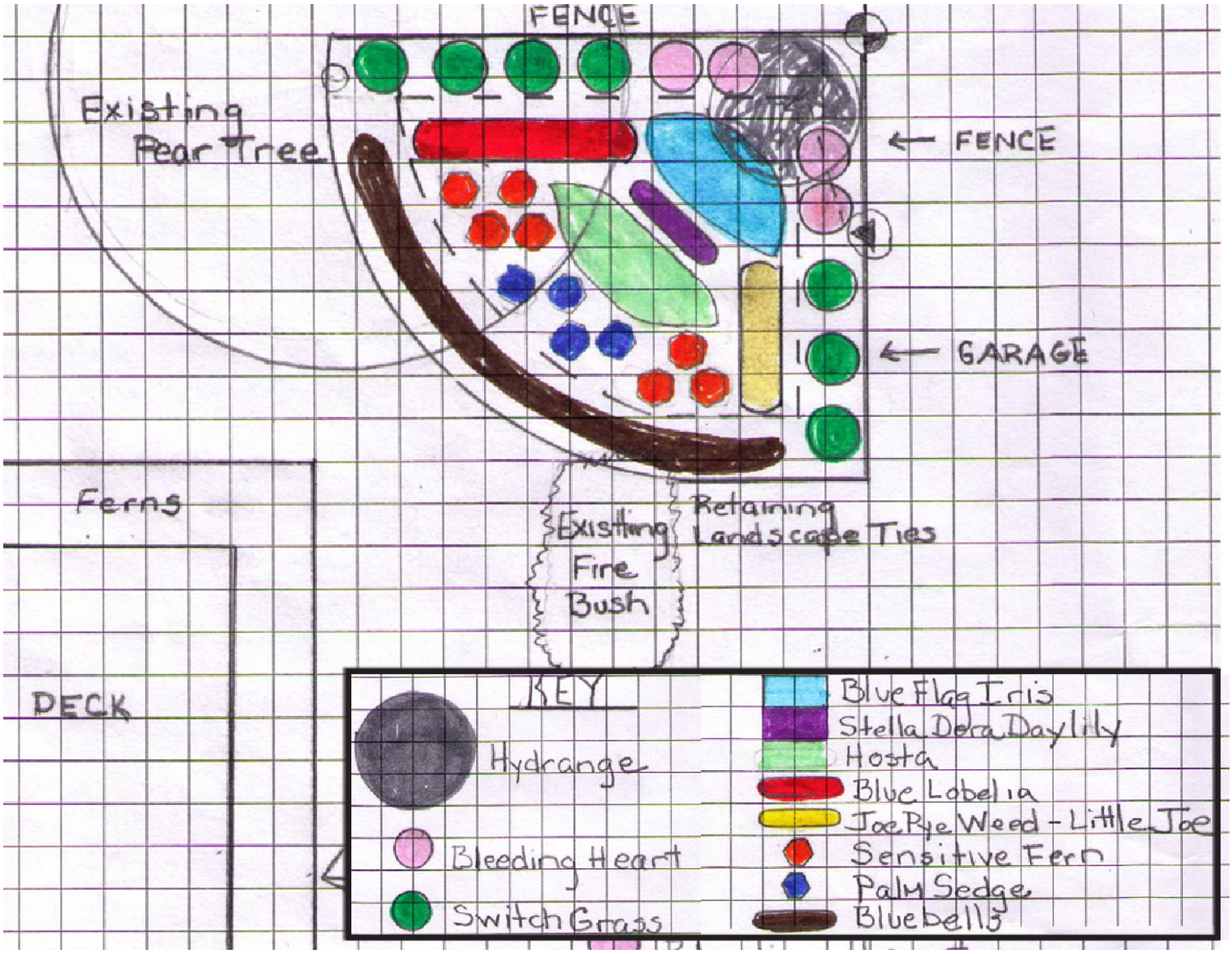
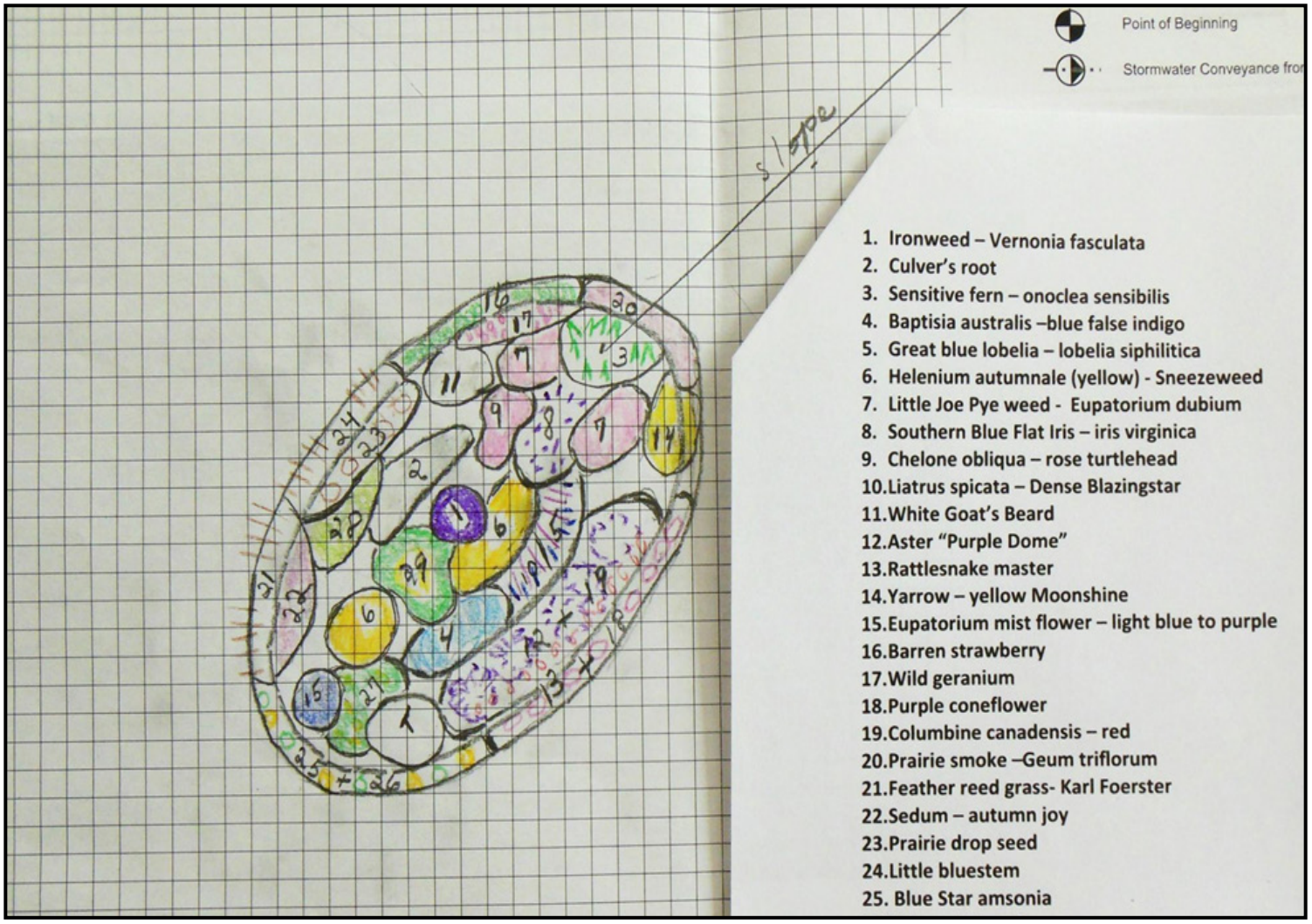



*Photo credit: Sallie Richie*

*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*

*Photo credit: Roger Bannerman*

# Transferring the design

1) Use a measuring tape and flags or a long garden hose to transfer your rain garden design to the ground  Adjust them to your liking.
2) Once you are satisfied with the shape and size, define the border with string or spray chalk.  This will be your guide for digging.
3) Remove the grass in your defined garden space and 12"-18" more than the border to minimize grass growth in your garden. Grass competes with the plants and creates more weeding work. Do this with a sod-cutter or kill the grass by laying down cardboard and mulch for about two weeks.
4) Once the grass is gone, dig a shallow depression (based on your size calculations) with a level bottom. Build a berm on the downhill side to hold the water within the garden like a bowl. Add a notch to the downslope berm for overflow water to go to a safe location.
5) The rain garden depression must be leveled: side to side , end to end, and the berm to the uphill edge. (Otherwise you will get ponding in one area)  Use a long board and a level to confirm.

**See suggestions for soil prepping on page 17 and for digging on slopes on page 18.**

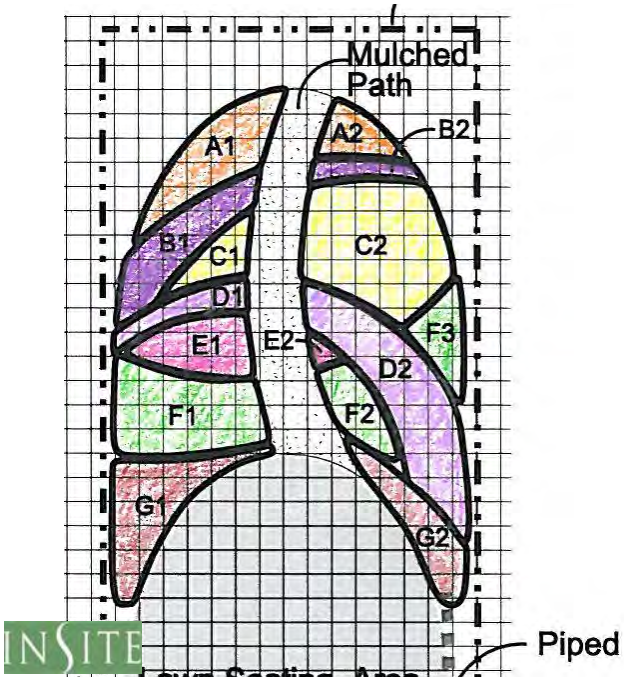
# Drainage
## With an Underground Pipe

- 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.
- The pipe should outlet above where the water will pool. Make sure to place the outlet of the pipe at an elevation above the elevation of the emergency overflow notch.
- 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
- The end of the pipe can end with a grate (shown) or with a pop-up.
- 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

- 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.
- Often water will infiltrate into the ground while moving along the channel.
- Your drainage channel can be made of stones, native plants, or simply be a lowered grassy pathway.




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

# Soil prepping

1) Dig the rain garden 2 inches deeper than the final intended depth, to make room for the compost mixture. See compost mixture guidelines below.
2) Lay 2 inches of compost mixture down in the rain garden bottom and sides. Till the compost into soil. The shape of your garden should look like a shallow saucer- bottom will be deeper than the sides.
3) Plant your plant materials now. Then cover with 2 inches of hardwood shredded mulch.
4) Use cubic yards calculation, below, to determine how much compost mixture and mulch you will need.

**Compost Mixture guidelines:**

Moderately well drained soil: 50% compost, 30% sharp sand(not beach sand), & 20% topsoil (w/little to no clay content)

Moderately poor to poorly drained soil: 70-100% compost & 0-30% sharp sand. (compost absorbs water)

**Cubic Yards Calculation:**

(A * 0.00617) = material in cubic yards

where A = the area, in sq. ft., feet of garden. This the same as your runoff area from page 8.

This calculation can be used for compost and mulch material and is for depths of 2".

# Planting

If you have perennials in your garden that are adapted to both wet and 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. Plants in pots have root systems that can resist the movement of water.

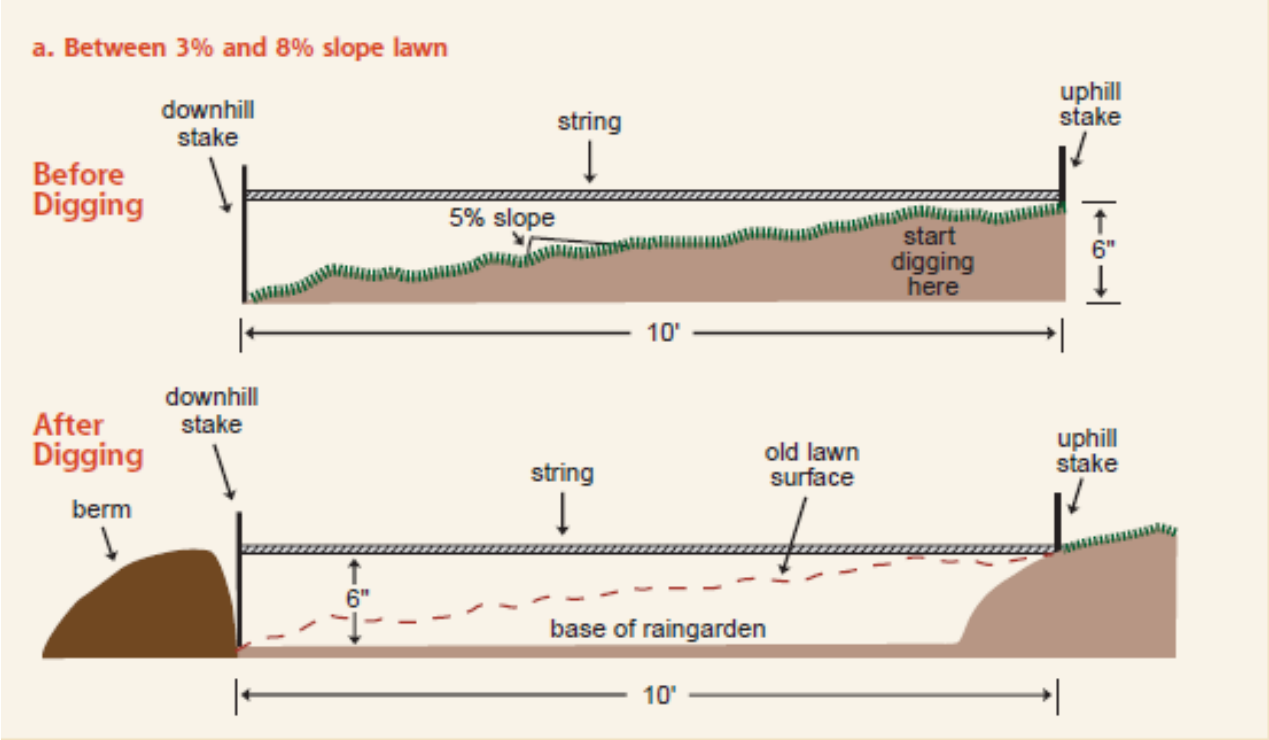
**Calculate number of plants needed:** as a basic guide, take garden square footage and divide it by 2.25 for number of plants needed, placed about 18" apart. A garden center can help you with more accurate number once you decide the types and sizes of plants you want.

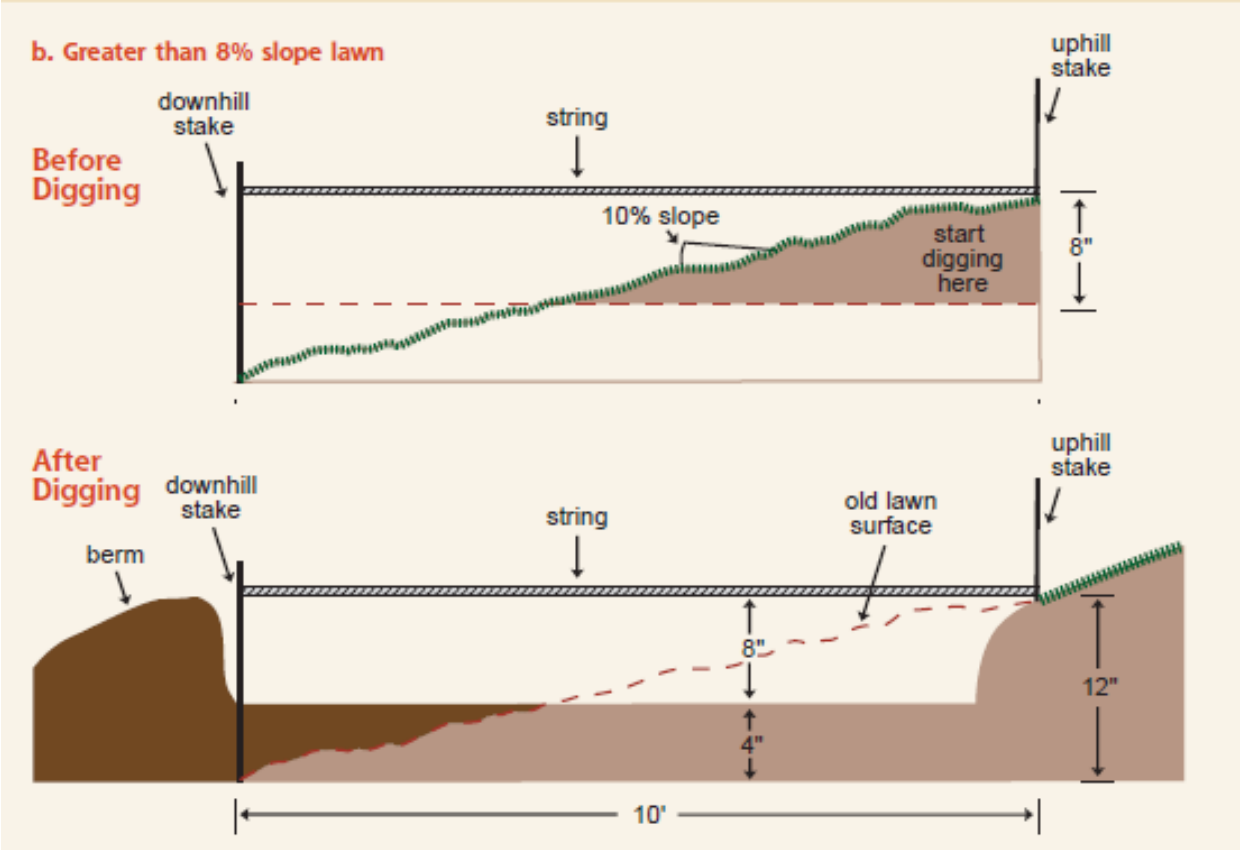
**To plant:** dig a hole deep enough that the roots can hang vertically. If the roots are root-bound, break them up. Place the plant deep enough so that the entire root ball is covered but the base of the stem is above the soil. Fill the hole and pat firmly to remove any air space. Then cover with shredded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

**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 fully 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.*

# Digging on various slopes



# Maintaining

- Water your newly-planted rain garden during its first growing season.
- Remove weeds regularly.
- Remove any dead stems or seed heads that do not appeal to you.
- Evaluate your rain garden each year. Fill any holes with the addition of other appropriate native plant species.
- To keep your garden looking neat, maintain its boundary by clipping and mowing. Consider edging the rain garden with natural stone on the downhill side. Avoid using a raised edge treatment on the side where water flows into the rain garden.
- In early spring, cut back last year's growth from grasses and perennials. Leave the plants standing throughout the winter for visual interest. Many native grasses look attractive during this time of year.
- Do not apply lawn fertilizers too close to your rain garden. When native plants are fertilized, especially with nitrogen, they tend to grow too tall to hold themselves upright. Additionally, fertilizing can stimulate weed growth and create competition for the native plants.

**What About Mosquitoes? Stormwater runoff entering your rain garden should disappear within 24-48* hours of a rain event. Mosquitoes need at least a week of standing water to complete their life cycle. A poorly maintained bird bath or rain gutter is a more likely breeding ground.**

*If your rain garden is not draining in 48 hours, you may need to fix your soil to create more infiltration capacity.

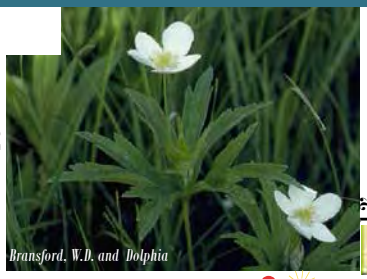
# Recommended Native Plants

These are the top twenty native 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 the most dry. The bottom three rows (in green) should be planted on the bottom of your rain garden, where it is the most wet.

**New england aster** *Aster novae-angliae*


Blooms: September - October

**Canada anemone** *Anemone canadensis*




Blooms: May - June

**Wild geranium** *Geranium maculatum fulgida*


Blooms: May - June

**Goldstrum black-eyed susan** *Rudbeckia*


Blooms: July - September

**Ninebark** *Physocarpus opulifolius*


Blooms: May - July

**Redbud** *Cercis anadensis*


Blooms: May

**Wild strawberry** *Fragaria virginiana*


Blooms: May - June

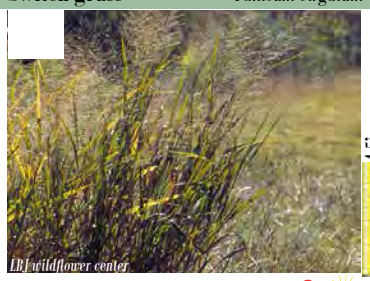
**Kobold blazing star** *Liatris spicata*


Blooms: July

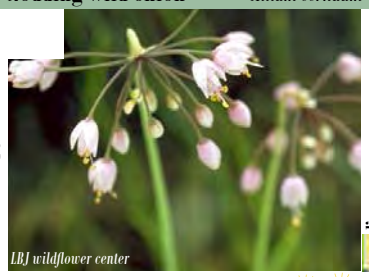
**Purple coneflower** *Echinacea purpurea*


Blooms: July - August

**Switch grass** *Panicum virgatum*

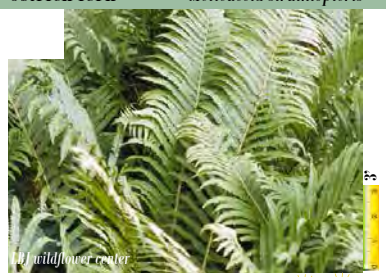



**Nodding wild onion** *Allium cernuum*




Blooms: September - October

**Ostrich fern** *Metteuccia struthiopteris*




**Goldfinger potentilla** *Potentilla fruiticosa*


Blooms: June - July

**Fox sedge** *Carex vulpinoidea*

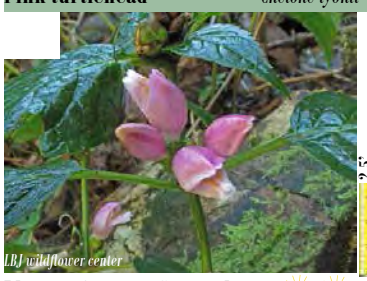

**Red-osier dogwood** *Geranium maculatum*


Blooms: May - June

**Rose Mallow** *Hibiscus moscheutos*

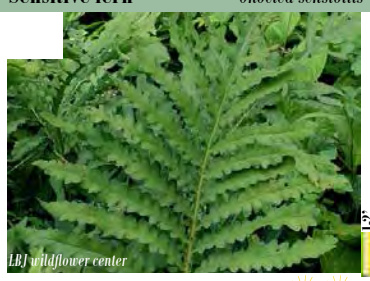

Blooms: August - September

**Pink turtlehead** *Chelone lyonii*




Blooms: August - September

**Sensitive fern** *Onoclea sensibilis*




**Blue lobelia** *Lobelia siphilitica*


Blooms: July - September

**Blue flag iris** *Iris virginica*


Blooms: May - June

**Legend** full sun | part sun | aggressive spreader

# Invasive species

An invasive species is one that is not native and whose introduction ***causes harm***, or is likely to cause harm to Michigan's economy, environment, or human health.

Many non-native species in Michigan, including fruits, vegetables, field crops, livestock, and domestic animals, are important to our economy and lifestyles. Most non-native species are not harmful and may provide economic benefits. Invasive species cause harm when they out-compete native species by reproducing and spreading rapidly in areas where they have no natural predators and change the balance of the ecosystems upon which we rely.

**Prohibited vs. Restricted Species:**

Some invasive species are legally designated by the State of Michigan as either "prohibited" or "restricted". If a species is prohibited or restricted, it is unlawful to possess, introduce, import, sell or offer that species for sale as a live organism, except under certain circumstances.

The term "prohibited" is used for species that are not widely distributed in the state. Often, management or control techniques for prohibited species are not available.

The term "restricted" is applied to species that are established in the state. Simply having these species on your property isn't a violation of the law if they are naturally occurring. However, you should take steps to control them and you cannot intentionally propagate or spread these species on your property or through sales or free distribution. Management and control practices are usually available for restricted species.

Michigan's Natural Resources Environmental Protection Act (Part 413 of Act 451) established the list of prohibited and restricted species, which is regularly amended by Invasive Species Orders.

**Additional Information about Invasive Species:**
Additional information, including species profiles and reporting information, tips for preventing the spread of invasive species, laws, and outreach materials is available online at: **www.michigan.gov/invasives/**

Useful information about invasive plants and landscape alternatives is available at: **www.mipn.org**

***Prohibited in Michigan***

Japanese Knotweed
*Fallopia japonica*

Multiflora Rose
*Rosa multiflora*

Japanese Barberry
*Berberis thunbergii*

Common Buckthorn
*Ramnus carthartica*

# Common invasives

Refrain from buying, planting, or allowing these common invasives to grow. Weed them out!

Yellow Iris
*Iris pseudacorus*

Restricted in Michigan

Purple Loosetrife
*Lythrum salicaria*

Garlic Mustard
*Alliaria petiolata*

Restricted in Michigan

Autumn-Olive
*Eleagnus umbellata*

Dames Rocket
*Hisperis matronalis*

Restricted in Michigan

Phragmites
*Phragmites australis*

## Map invasive species using the MISIN app

from the Midwest Invasive Species Information Network at **www.misin.msu.edu**

# Compost info

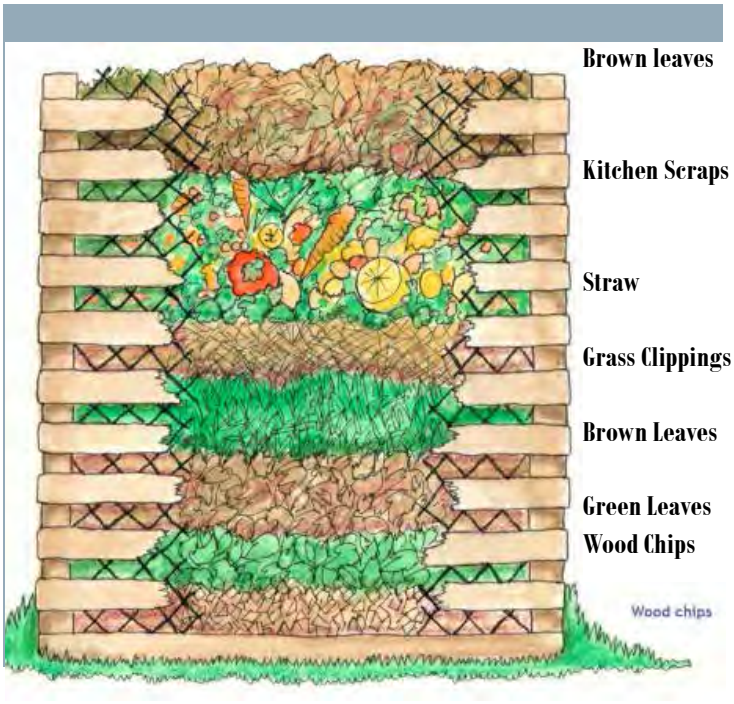
*1 cubic yard of farm compost or topsoil weighs approximately 1 ton*

Pickup truck capacities: most 1/2 ton pickup trucks and short bed pickup trucks have a volume capacity to hold 1.5 cubic yards but most don't have the weight capacity to safely haul more than 1 cubic yard.
3/4 and 1 ton pickup trucks have the capacity to hold up to 2 cubic yards.

Coverage for spreading compost, topsoil or mulch:

1 cubic yard @ 1" depth covers 324 square feet
2" depth covers 162 square feet
3" depth covers 108 square feet
4" depth covers 81 square feet

Or use the calculator on the link below to estimate how many cubic yards you need:
**www.landscapecalculator.com/calculators/mulch**




*Build your own compost with kitchen food scraps and yard waste. Graphic courtesy of landscapeforlife.org*

## Find Inexpensive Local Compost at:

**Southeastern Oakland County Resource Recovery Authority (SOCRRA) Compost Site:**
1741 School Road, Rochester Hills, MI 48307
(south of Avon Rd, between Dequindre and John R.)

Year-round, Monday – Friday: 8AM to 4PM

**Compost Pricing – Shovel yourself**
SOCRRA and Rochester Hills Residents: Free
General Public: $15 minimum charge, covers up to one yard; $15/yard each additional yard

**Compost Pricing – SOCRRA will load**
$30 minimum charge, covers up to two yards; $15/yard each additional yard

**Note: SOCRRA compost is made of materials collected and may contain debris, roots, seeds, and other potentially undesirable materials.**

## You can also purchase compost from local garden stores.

# Notes

**City of Royal Oak**
**211 S. Williams St.**
**Royal Oak, MI 48067**

**For more information, please call 248-246-3202.**

**Visit us online at**
**https://www.romi.gov/raingardens**

**This guidebook was adapted from the Washtenaw County's Rain Garden Course Pack. Many thanks to the Washtenaw County Water Resources Commissioner's Office, SOCWA, Wisconsin DNR, Kalamazoo County, and Kansas City, Missouri for use of their rain garden information in this publication.**

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