SCHOOLYARD RAIN GARDENS

How to Design, Build and Maintain a Rain Garden
Classroom Lessons for Second through Sixth Grades

2nd and 3rd graders planting a rain garden | Spring 2017 | Photo credit: Linda Prieskorn

Washtenaw County Water Resources Commissioner's Office
Funding from the Community Foundation for Southeast Michigan

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PART 1: SCHOOLYARD RAIN GARDEN ESSENTIALS

Completed Rain Garden at Pattengill Elementary, Fall 2017

INTRODUCTION

A rain garden is a shallow bowl-shaped garden that soaks rainwater into the ground and is full of native plants. It fills with the rain that falls on it – plus rainwater that runs off a hard surface like a roof or a driveway. Water running off of hard surfaces picks up pollutants like phosphorus and nitrogen from fertilizers; bacteria from animal waste; oil, grease and heavy metals from cars, and just plain old "dirt" called sediment. Usually this dirty water ends up going down a stormdrain and straight into our creeks and rivers, unfiltered. By capturing the rain water in a garden, we are helping to filter the water clean by letting it slowly soak into the ground.

Rain gardens not only filter water, they also create great wildlife habitat and can reduce puddling. By building a rain garden at a school, it can be used as a teaching tool for lessons in plants, soils, habitats, the water cycle and more!

This manual was created by the Washtenaw County Water Resources staff with funding from the Community Foundation for Southeast Michigan. The manual aims to provide you with the information, lessons and expertise needed to build and care for a rain garden at your school.

Pattengill Elementary School teacher and students planting garden | photo by Kelly Cheladyn

TIMELINE

spring planting

fall planting

Project Plan

- funding (~$1,000) — winter
- decide on site & see if clay soil — summer
- design
- make plant & supply list
- place orders
- onboard teachers

Classroom Lessons

- schedule dates — March
- get supplies and make copies — September
- teach lessons

Plan Workdays

- schedule digging workday for 3 hours on a day when parents can attend — April
  recruit at least 20 volunteers — September
- schedule planting workday, 1 hour per class and 2-3 classrooms of about 28 students (set rain dates)

Prepare for Digging Workday — May

- call Miss Dig two weeks before digging day — October
- coordinate supply drop offs
- borrow tools
- mark rain garden site with string and stakes

Digging Workday

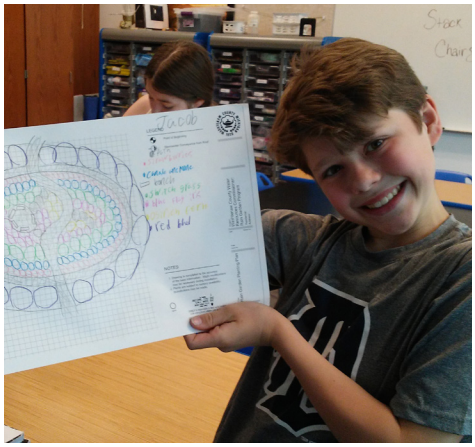
- dig shape of rain garden — May
- add in 2" compost & till into soil — October
- seed any bare areas where fill dirt was placed

Planting Workday — May

- spread the mulch, plant plugs and water with students — October

Ongoing Maintenance

- water during the first summer (2x/week for 1 hr) — Ongoing
- weed as needed (at least 2x/ year) — Ongoing



CHECKLIST

1. **Plan**

   Funding: _____

   Timeline (spring or fall): _____

   Participating Teachers and/or Staff: _____

2. **Classroom Lessons**

   □ Lesson 1: Stormwater and the Water Cycle
   □ Lesson 2: Design a Rain Garden
   □ Lesson 3: Rain Garden Factsheet
   □ Copy best factsheets and give to all teachers and staff in school to communicate project

3. **Site Selection and Design**

   Site: _____ Clay Soils?: Yes or No

   Fill area location: _____

   Water source nearby? Yes or No

   □ Design □ Plant List □ Supply List

4. **Supply Order**

   □ Order compost, mulch, grass seed and soil erosion blanket
   □ Coordinate additional tools: hose, water key, shovels, gloves, rototiller, rakes, wheelbarrows, buckets, etc.

   Contact person for delivery: _____

   Location for delivery: _____

   Plants will likely need to be cared for between the time of delivery and the planting day.

   Plant caretaker and day of transporter: _____

5. **Digging Workday**

   □ Before workday, stake out shape of rain garden with small stakes and string or flour.
   □ Recruit 20 adult volunteers for 3 hours. Set a rain date.

   Date and time: _____

   Volunteer coordinator: _____

   School waiver of liability? Yes or No

   Digging Workday Tasks:

   - Remove turf grass and set to the side
   - Dig rain garden shape at a depth of 5-8 inches
   - Move extra dirt to create berm or to fill site

- Spread 2 inches of compost into rain garden and rototill
- Transplant turf grass on top of fill dirt and/or scatter grass seed over bare dirt. If using seed, spread soil erosion fabric over fill dirt and secure with wooden stakes.

6. **Planting Workday**

Two – three classrooms of about 25 students will be needed to plant if they each spend one hour working. Before the students arrive, use string and stakes to rope off areas where each species will be planted.

Classroom coordinator: _____

□ Recruit 3 or 4 adults to lead smaller groups of students: mulchers, plant preparers, planters and waterers

Planting Workday Tasks:

- Fill buckets and wheelbarrows with mulch and spread throughout the rain garden at a depth of 2-4 inches.
- Some students can prepare the plant plugs by gently pulling them out of their trays and loosening the roots. They can then bring the plants to those digging holes within the rain garden.
- Some students will have small hand trowels which they will use to dig holes (about 6 inches deep) and then plant the plants. After the plant is in the hole, they need to put all the loose soil that was removed back into the hole and press down on the dirt so there aren't any air bubbles around the plant roots.
- A few students can water the newly planted plugs.

7. Ongoing Maintenance

□ Recruit parents, neighbors or staff to adopt the rain garden and provide regular maintenance during the growing season

□ Organize a spring and/or fall workday with students

Supplies

□ compost & mulch
□ plants
□ turf grass seed
□ soil erosion blanket

Tools

□ Tape Measure
□ Line Level
□ String
□ Wood stakes
□ Shovels
□ Rakes
□ Trowels
□ Rototiller
□ Wheelbarrows

LOCATING & MEASURING

1) The garden must be at least 10 feet away from any building to prevent potential water seepage into the basement.

2) Select a naturally low spot that is flat or gently sloping and is downhill of the downspout. Avoid tree roots. Make sure overflow from the 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.

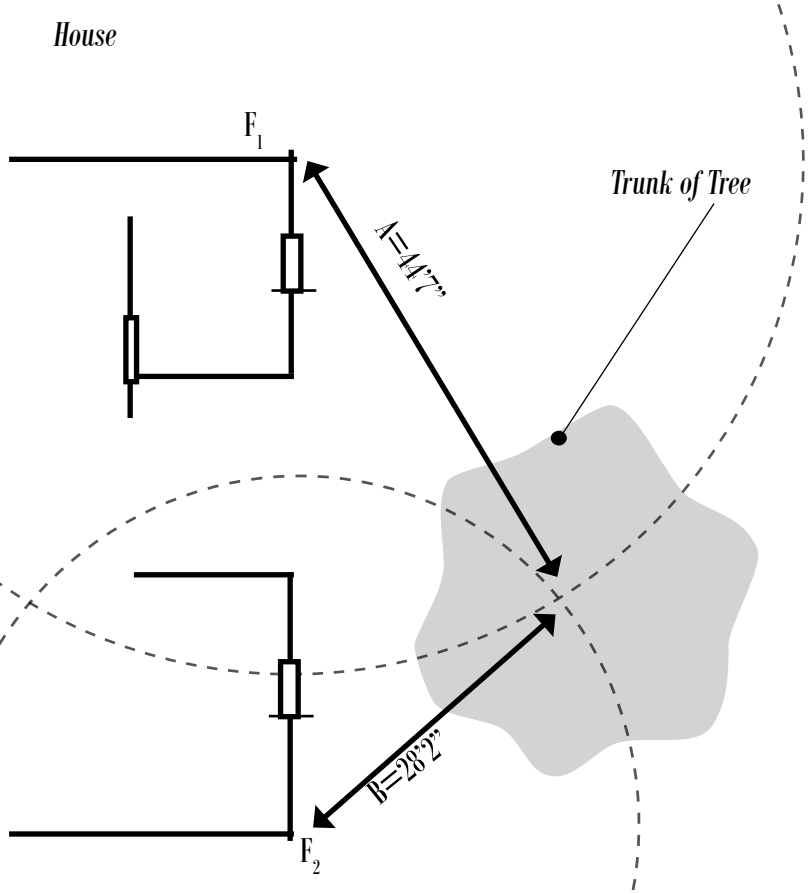
Now that you have chosen a general location for the future rain garden, create a base plan that has all the elements that are currently on the site. This is so you can draw up a rain garden plan. Include the house, trees, fences, sheds and bed lines that are near the future rain garden in the base plan. Being able to draw the rain garden plan "to scale" on an accurate base plan will help accurately estimate quantities of plants, mulch & 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 (trees, fences, etc.) To do this, measure the difference between all the fixed spots. Sketch them in 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, draw a semi-circle with the other end. Make the string the distance to the other fixed spot (F_1). 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.

Activity courtesy of J. Hiss & N. Booth, (2002) "Residential Landscape Architecture" Design Process for the Private Residence. Prentice Hall.

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 3-6'' deep and 20-40% 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 20% the size of your hard surfaces and the depth to be between 4 and 6 inches. If the hole takes longer than 24 hours to drain, size it at 40% your impermeable surface area and a depth of 3".

Time to Drain	Impermeable Multiplier	Depth in inches
within 24 hours	0.2	4-6
longer than 24 hours	0.4	3

5) Multiply the total area of impervious surfaces by 0.2 to find the area needed for a rain garden. If your hole takes longer than 24 hours to drain, then multiply by 0.4 to find the area needed for your rain garden.

Example
If impermeable surface draining into my rain garden is 750ft^2 and my test hole drains within 24 hours

750 x .2 = 150ft^2

My rain garden must be at least 150ft^2 & 4-6" deep. The dimensions could be 15'x10' or 5'x30'.

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.

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.

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

DRAINAGE

With an Underground Pipe

Sometimes it is necessary to direct water to the rain garden underground with a pipe.

1) Make sure to place the pipe at or above the top of the lower berm so that water won't sit in the pipe

2) Use a non-perforated pipe with a 4'' diameter to prevent clogging and keep up with heavier rains. The end of the pipe can end with a grate (shown) or with a pop-up

3) Place a few stones where the pipe outlets in the garden to reduce erosion

Rain garden in Dexter. Photo credit: Susan Bryan

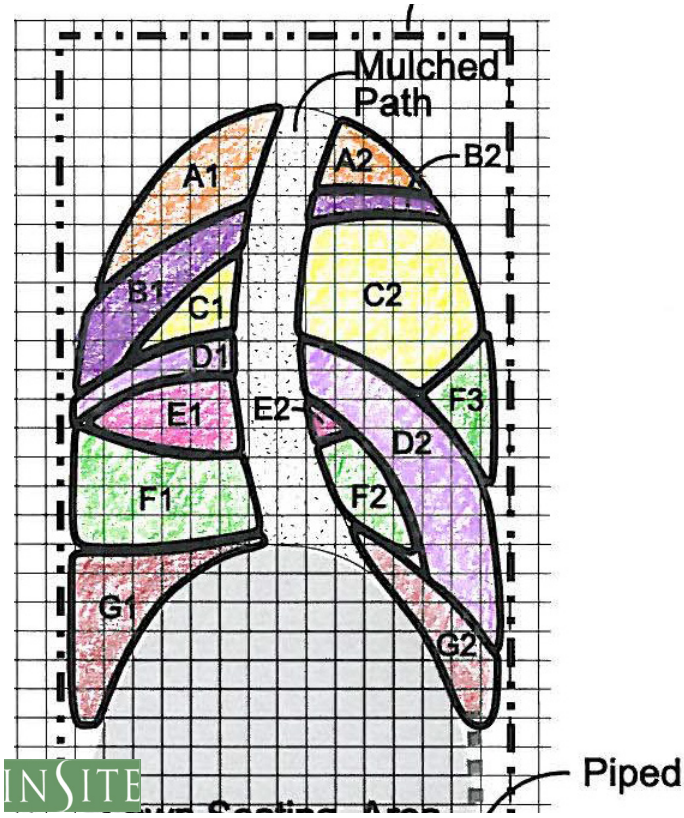
Over Land

Water will run overland to your rain garden if a downhill channel has been created from your downspout to your rain garden

1) 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

2) Be careful when mowing near your channel

Design by Shannan Gibb Randall. Photo credit: Harry Sheehan



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*

Blooms: May - June

Goldstrum black-eyed susan *Rudbeckia fulgida*

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 fruticosa*

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

COMPOST & MULCH

You will dig the rain garden 2 inches deeper than the final intended depth. You will then add 2 inches of compost on the rain garden bottom & sides. You will cover that with 2 to 4 inches of hardwood shredded mulch.

Determine how much compost and mulch is required to cover the garden with the following calculation:

(A * 0.00617) = material in cubic yards

where A = area in square feet of garden

Area can be calculated by counting the squares on your base plan drawing. Calculation can be used for either compost or mulch material and is only for depths of 2''.

For a 400 square foot rain garden:

400 * 0.00617 = 2.5 cubic yards of compost (spread 2" thick)

I typically spread 2 inches of compost, but 4 inches of mulch so I will need 2.5 cubic yards of compost and 5 cubic yards of mulch.

left: Eastern Michigan family housing rain garden | Photo credit: Shannan Gibb-Randall
right: 5th graders spreading mulch at Holmes | Photo credit: Linda Prieskorn

DESIGN

1) Use the base plan you made to draw in the rain garden outline. Draw in the berm, if you are digging on a slope, on the downslope sides (see page 23 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.

2) Make sure there is at least ten feet of distance
between any structure with a basement to the rain garden to prevent water damage. Generally, the rain garden should be at least 2 feet away from the property line and shouldn't negatively impact your neighbor's property.

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

4) Decide the form of water conveyance to the rain garden: overland swale or underground. Record the path and type of conveyance on the drawing.

5) Select plants. Plants for the sides and bottom of the rain garden should include those adapted to the extremes of wet and dry conditions. The berm should include plants adapted to dry conditions.
See the suggested plant list on page 25.

6) Incorporate a diverse mix of sedges, rushes and grasses with your flowering plants. Consider the height, bloom time, sun requirements and color to create a varied garden.

7) Defined edges make a naturalized area look more deliberate. Label plants to ease identification during weeding.

King Elementary School 5th graders planting the rain garden in the fall of 2017
Photo Credit: Linda Prieskorn

Sample: sun

Miller Ave Rain Garden

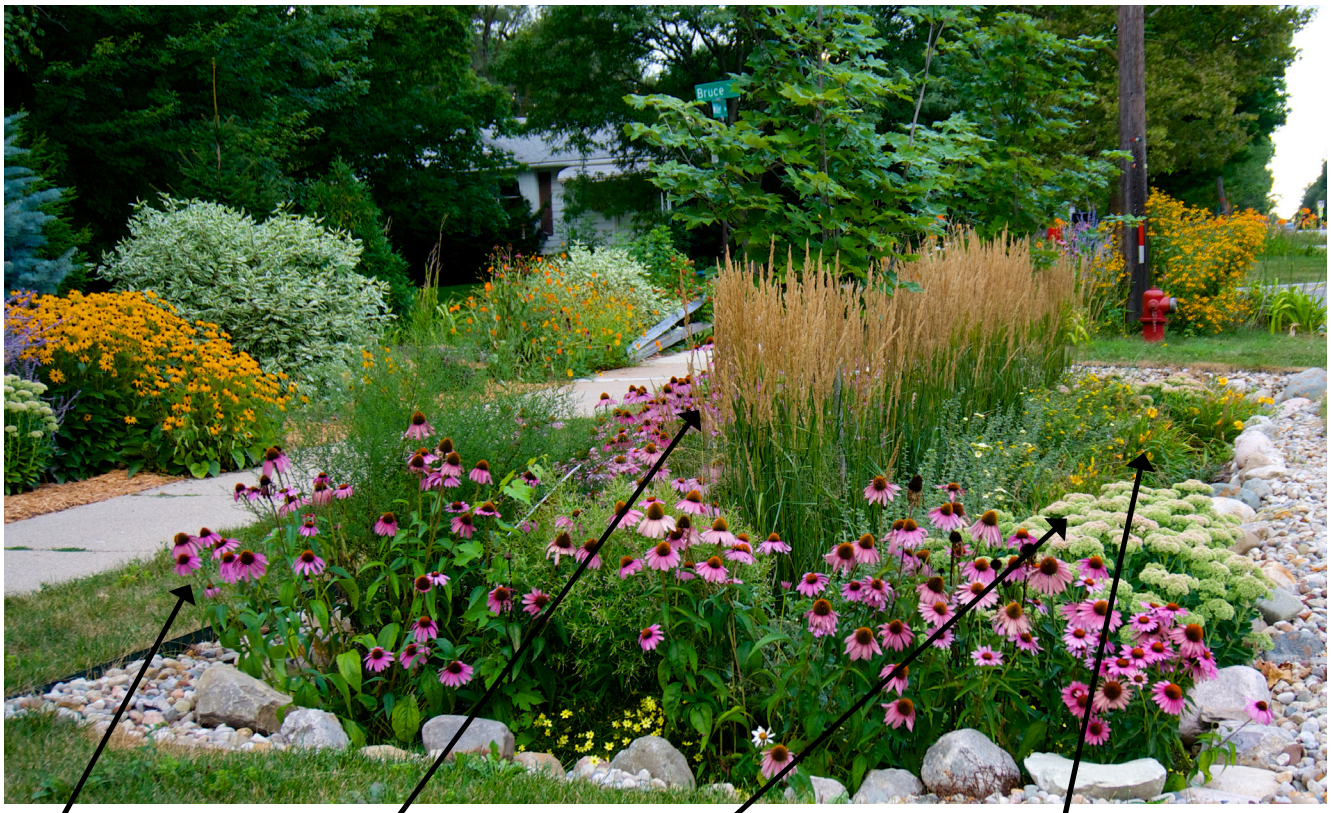


Photo Credit: Linda Prieskorn

Purple Coneflower
Echinacea purpurea

Feather Reed Grass
Calamagrostis acutiflora

Autumn Joy Sedum
Sedum x 'Autumn Joy'

Hyperion Daylily
Hemerocallis 'Hyperion'

Sample: shade

Residential Rain Garden

Blue Flag Iris
Iris virginica

Cardinal Flower
Lobelia cardinalis

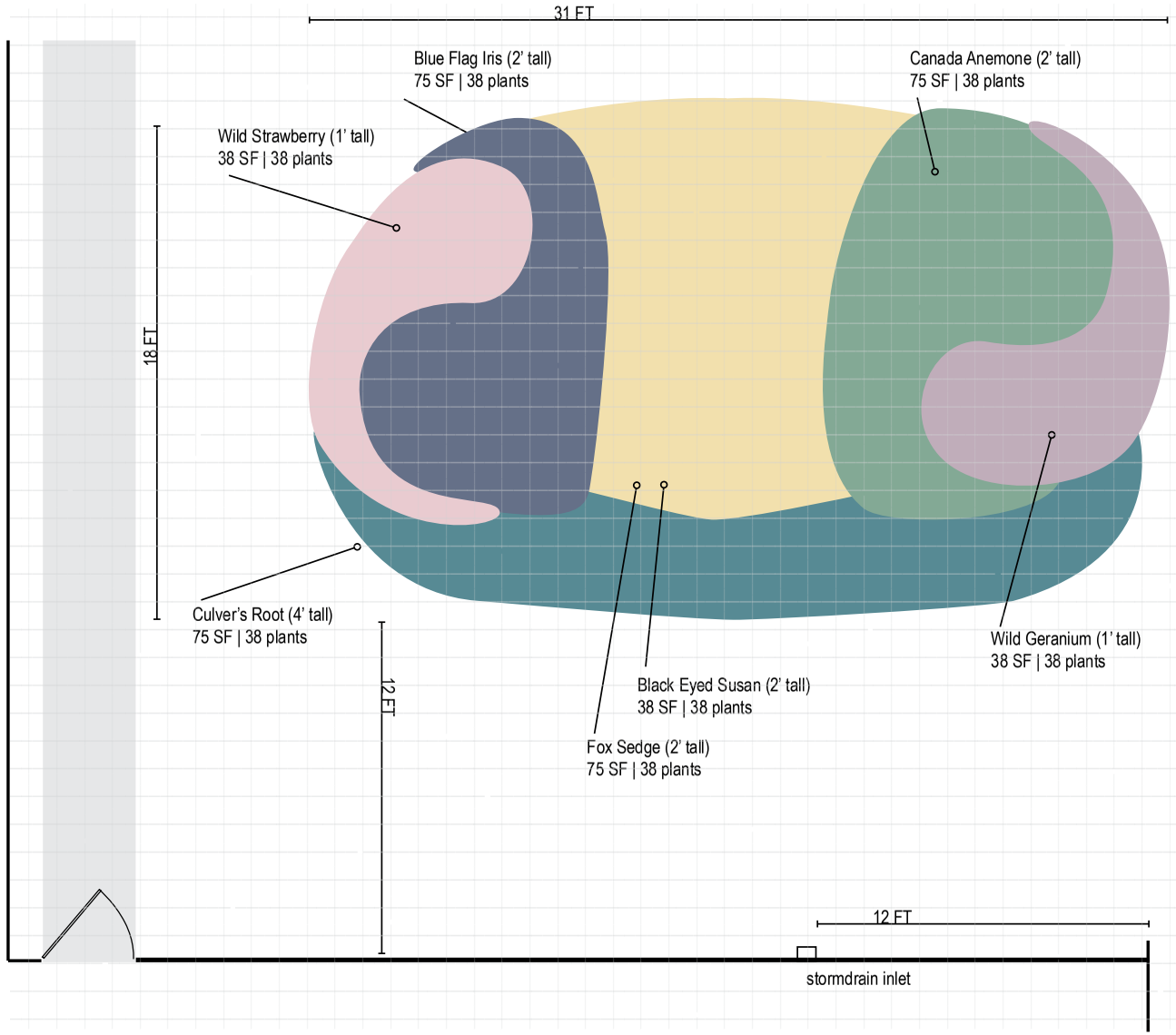
Switchgrass
Panicum virgatum

Wild Geranium
Geranium maculatum

Sample Design: sun

Holmes Elementary Schoolyard Rain Garden, Ypsilanti Michigan

Holmes Elementary School Rain Garden Design



spring fall summer

Planting Plan

Common Name	Color	Bloom Time	Spacing	No
1. Black-Eyed Susan, *Rudbeckia fulgida*	yellow	fall	12"	38 plugs
2. Blue Flag Iris, *Iris virginica*	blue	spring	18"	31 plugs
3. Canada Anemone, *Anemone canadensis*	white	spring	18"	38 plugs
4. Culver's Root, *Veronicastrum virginicum*	white	summer	12"	38 plugs
5. Fox Sedge, *Carex vulpinoidea*	green	spring	18"	38 plugs
6. Wild Geranium, *Geranium maculatum*	lavender	spring	12"	38 plugs
7. Wild Strawberry, *Fragaria virginiana*	white	summer	12"	38 plugs

Additional Supplies

	Area	Units	Cost	Total
Rain Garden	400	SF		
Mulch (4" deep)	5	CY	$45/CY	$247.50
Compost (2" deep)	2.5	CY	$37/CY	$83.25
Plant labels (25/pack)			$20/pack	$20

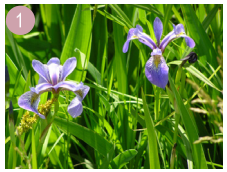
Draft design for Holmes Elementary, prepared by partner organization the Water Resources Commissioner's Office. Costs from local plant producer, WildType. Species were chosen to maximize bloom time, to be short for visibility and to provide wildlife habitat.

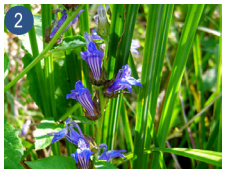
Sample Design: part sun

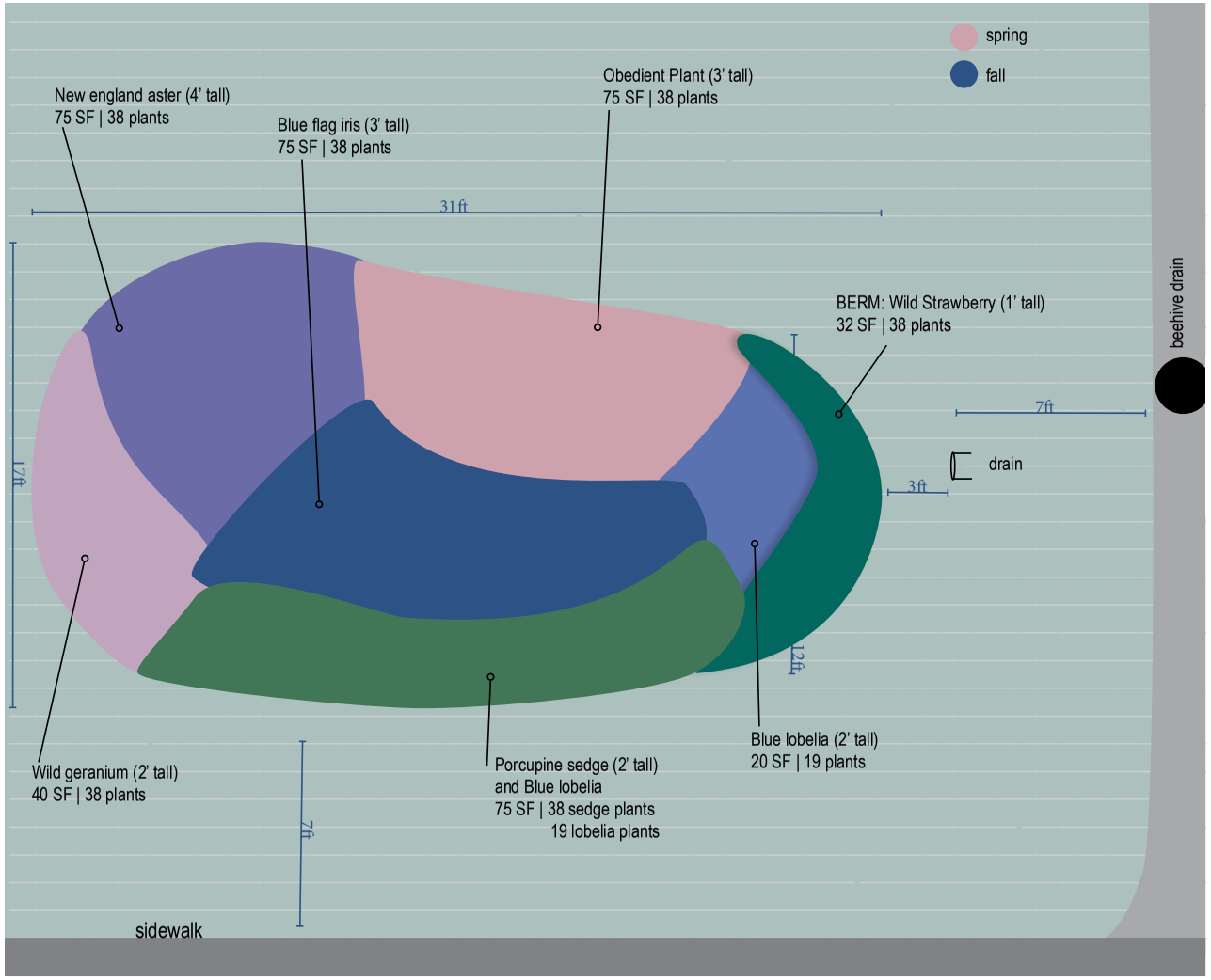
Summers Knoll Schoolyard Rain Garden, Ann Arbor Michigan

Summers-Knoll School

Rain Garden Design







Draft design prepared by partner organization the Water Resources Commissioner's Office. Costs from local plant producer, WildType. Species were chosen for the following reasons:

- to maximize bloom time when school is in session
- to provide varied texture , especially for special education students
- to provide good habitat for butterflies and other species
- to match site conditions for soil (B), light (part sun), & local SE Michigan conditions

Planting Plan

	Common Name	Color	Bloom Time	Space	Cost	No	Total
1	Blue flag iris, *Iris virginica*	blue	spring	18"	$47.50/38 plugs	38 plugs	$47.50
2	Blue lobelia, *Lobelia siphilitica*	blue	fall	12"	$47.50/38 plugs	38 plugs	$47.50
3	New England Aster, *Aster novae-angliae*	purple	fall	18"	$42.56/38 plugs	38 plugs	$42.56
4	Obedient plant, *Physostegia virginiana*	pink	late summer	18"	$47.50/38 plugs	38 plugs	$47.50
5	Porcupine sedge, *Carex hystericina*	n/a	n/a	18"	$42.56/38 plugs	38 plugs	$42.56
6	Wild geranium, *Geranium maculatum*	purple	spring	12"	$76/38 plugs	38 plugs	$76
7	Wild strawberry, *Fragaria virginiana*	white	spring	12"	$47.50/38 plugs	38 plugs	$47.50
						TOTAL	**$351.12**

Additional Supplies

	Area	Units	Cost	Total
Rain Garden	400	SF		
Mulch (4" deep)	5	CY	$18/CY	$90
Topsoil (2" deep)	2.5	CY	$18/CY	$45
Delivery Fee				$65
			TOTAL	**$200**

Total Cost: $551.12

PART 2: SCHOOLYARD RAIN GARDEN LESSONS

second graders from Cornerstone Elementary present their rain garden designs

Stormwater and the Water Cycle Lesson Plan

Created by the Washtenaw County Water Resources Commisisoner's Office with funding in part from the Community Foundation for Southeast Michigan

OBJECTIVE
Learn the role of stormwater and rain gardens in the water cycle

GRADE LEVEL (GL)
2nd through 6th grade

SUPPLIES
- The Puddle Garden by Jared Rosenbaum
- Use worksheet one for grades 2-4th and two for 5 and 6th
- Game dice, taped together or taped onto wooden blocks
- Labels for each station

BACKGROUND
- Read the book, The Puddle Garden and then talk about how rain gardens create a home for plants and animals. They also help stop puddling because they hold stormwater in place so it can go down into the soil, or up into plants
- Draw parts of the water cycle on the board (see example on next page) and talk about how water moves through each part: cloud, Bird Hills, Huron River, rain garden, plant, animal, groundwater. Explain groundwater in depth, and make sure to say water that travels through the ground gets cleaned.

WATER CYCLE GAME
Place each station label and dice on desks around the room. Note the small corner label on each dice, ie: "1. drain" is round one, drain station.

Rules

Each student is a droplet of water, working in groups of two or three. There are two rounds and during each round you will visit 8 stations. You'll start at the station that I send you to. First write your names and the name of your station on your paper. Then roll the dice at your station and read what it says. Follow the dice's directions to go to the next station. Write down that station on your paper, and all the next stations that you visit. Demo a few rounds. Then send the students in groups to different stations.

Round One

- After they have completed round one, have them all come back to the carpet and share. Use all of their water cycle journeys to draw arrows and show one water cycle on the board. Prompt- *raise your hand if you went to the cloud. Tell me, where did you go next?* (mountain) *Raise your hand if you went to the mountain. Where did you go next?*
- Ask *where they went after they landed in the stormdrain* (only to the river). Have one student get the stormdrain dice and read all of the sides, which will all say Huron River. *Why did I make that dice say only Huron River?* Because all water that lands in the drain flows directly to the river.
- Add a road, house and stormdrain to the drawing and talk about why drains might be a good thing or not.
  Good: stops flooding in road and/or houses
  Bad: trash, fertilizer, pesticides, dirt, leaves, etc. can be washed directly into the river which hurts the fish and other animals
- Prompt- *how can we stop water from rushing into the stormdrain?* By building a rain garden (which they learned from the book). Brainstorm ideas of why rain gardens might be helpful?
- Draw in a rain garden, then say that in round two we will replace the stormdrain with a rain garden. Have the students help exchange the dice for round two, and change the rain garden sign to a stormdrain sign. Play round 2!

Round Two

- After round two draw a second water cycle journey like you did for round one. Ask the class where they went when they landed in the storm drain (river). Ask them where they went when they landed in the rain garden during round two. Many options: bird, plant, cloud, groundwater.
- *Do you think that is a good thing? Why?*
- *Is it better for raindrops to land in rain gardens or in stormdrains? Why and why not?*
- Have students answer the three questions at the bottom of their worksheet. When discussing the last question, take home messages include:

Rain gardens help stop puddling, make a home for plants and animals, and let water get cleaned up by going into the ground.

Stormdrains help stop flooding, but they stop the water droplets from going through the whole water cycle which means animals and plants can't use it.

For information on the Schoolyard Rain Garden Program contact Catie | wytychakc@ewashtenaw.org | (734) 222-6813

CONTAMINATION ADDITION

OBJECTIVE
Learn the role of stormwater and rain gardens in the water cycle. Learn how pollution can move through the water cycle.

GRADE LEVEL (GL)
5th and 6th grade

ADDITIONAL SUPPLIES

- Small pieces of colored paper cut into 1/2 inch squares. Cut about 100 pieces of red and 100 pieces of yellow
- Use worksheet two

ADDITIONAL RULES

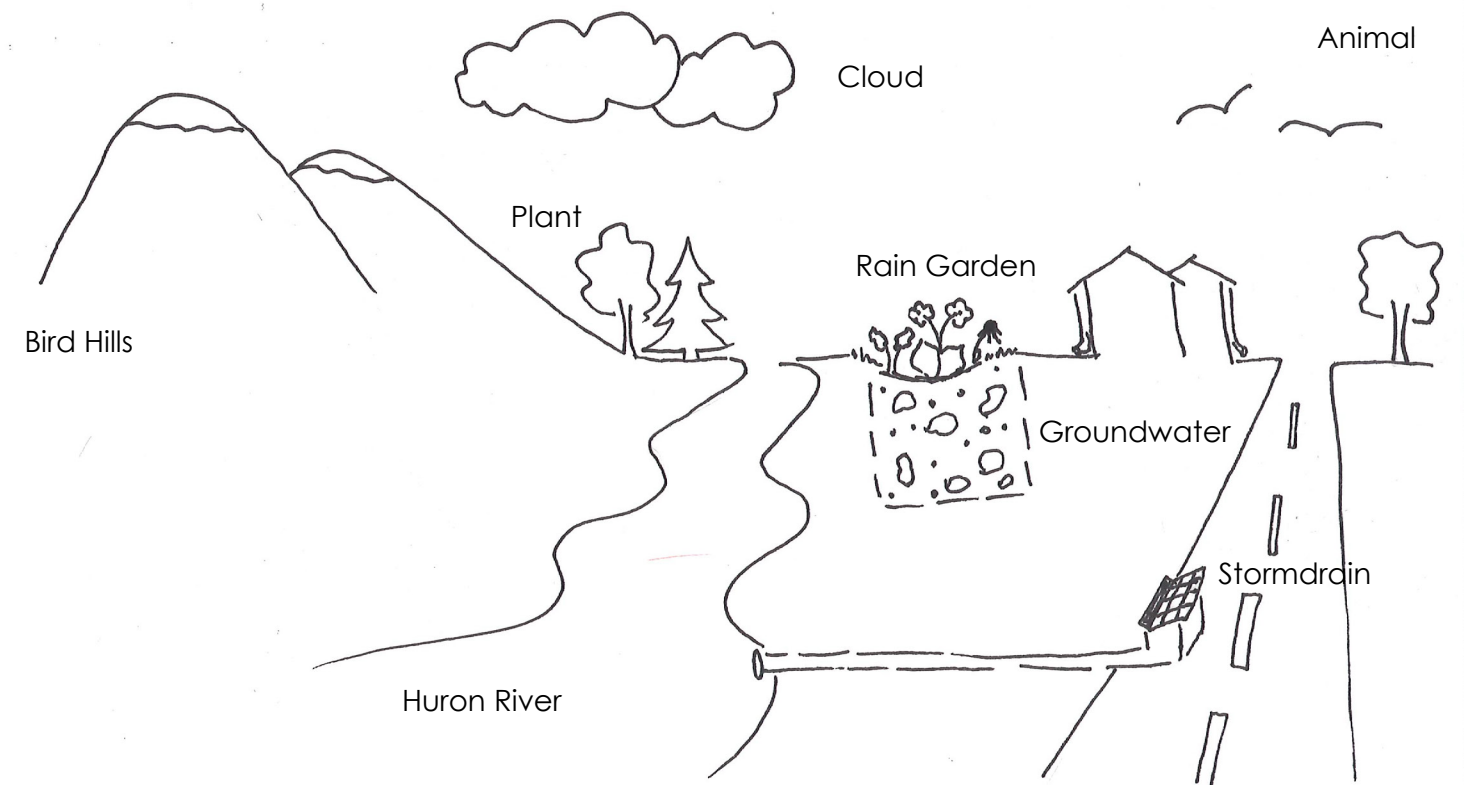
- Explain the additional rules of the game. Say there is an e-coli spill in the stormdrain for round one and the rain garden for round two (from a raccoon family!). There is a sediment spill (erosion from wind/water makes dirt come loose) on Bird Hills. Drop colored papers at each station. Red can be e-coli and yellow can be sediment. Each group will take 8 sediment particles (yellow) and/or 8 e-coli particles (red) when you arrive at the spill site and drop two off at the next 4 stations. If you have any left when your round is finished, leave them all at the last station.

Round One

- During each round, the facilitator should pick up all contaminants in the groundwater station because they are being 'cleaned' out by microbes
- After round one, talk about how important this is for keeping our water clean
- Have a student count up the number of contaminants in the river and record it on the board. Students should also record it on their worksheets

Round Two

- Prompt- *do you think there will be more contaminants overall in the first round or the second round?*
- There should be less contamination in the river after the second round because the rain garden is allowing stormwater to infiltrate into the ground where it will get cleaned up



Stormwater and the Water Cycle

worksheet one

Created by the Washtenaw County Water Resources Commisisoner's Office with funding in part from the Community Foundation for Southeast Michigan

GL 2-4

Names:_____

You are a droplet of water! Start at one of the stations posted around the room. Write down what station you are at on the first line below. Roll the dice at your station. Follow the directions to know what station to go to next. Write down each station that you visit in the lines below. For round one, once you have gone to 8 stations, sit down. As a class, we will record one water cycle. We will then play round two the same way.

Round 1:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

Round 2:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

As a class, we will discuss the following questions. Write down your answers.

1. In Round 1, where did you go when you landed in the stormdrain?

   _____

2. In Round 2, where did you go when you landed in the rain garden?

   _____
   _____
   _____

3. As a rain drop, would you rather land in a stormdrain or in a rain garden? Why?

   _____
   _____
   _____
   _____
   _____

Stormwater, Contamination and the Water Cycle

worksheet two

Created by the Washtenaw County Water Resources Commisisoner's Office with funding in part from the Community Foundation for Southeast Michigan

GL 5-6

Names:_____

You are a droplet of water! Start at one of the stations posted around the room. Write down what station you are at on the first line below. Roll the dice at your station. Follow the directions to know what station to go to next. Write down each station that you visit in the lines below. Pick up 8 sediment particles (red) and/or 8 E Coli particles (yellow) when you arrive at the spill and drop two off at the next 4 stations. If you have any left after 8 rounds, leave them all at the last station. Once you have completed your first round, sit down. As a class, we will record the number of E Coli and sediment for each round.

Round 1:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

Huron River e-coli _____

sediment _____

Round 2:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

Huron River e-coli _____

sediment _____

Discussion Questions:

1. In Round 1, where did you go when you landed in the stormdrain? Why is that?

   _____

2. In Round 2, where did you go when you landed in the rain garden?

   _____

3. As a rain drop, would you rather land in a stormdrain or in a rain garden? Why?

   _____

   _____

4. Did the amounts of e-coli and sediment in the Huron River change between the rounds? Why do you think that is?

   _____

   _____

   _____

Design a Rain Garden Lesson Plan

Created by the Washtenaw County Water Resources Commisisoner's Office with funding in part from the Community Foundation for Southeast Michigan

OBJECTIVE
Learn how rain gardens work and how to design one

GRADE LEVEL (GL)
2nd through 6th grade

SUPPLIES
- Teenage Rain Drop comic strip by David Zinn
- Use worksheet one for 2-5th grades and worksheet two for 6th grade

BACKGROUND
- Read a Teenage Rain Drop and talk about how a rain garden will help clean stormwater, reduce puddling and helps the animals and plants.
- Draw a rain garden sideview on the whiteboard and talk about the structure of a garden. Main components are that the garden is bowl shaped to hold water and has a layer of compost and mulch at the bottom.

DESIGN LESSON

Draw a Rain Garden Shape
- The first step is to draw a rain garden shape from a bird's eye view. It can be any shape. Then find the length and the width of the widest and longest part of the rain garden by counting the squares on the graph paper (1 square = 1 foot). This is helpful for when you build the rain garden outside.

Choose and Draw the Plants
- Explain the "Recommended Native Plants" page and note that some plants have animal companions and that it is good to have a diversity of heights, bloom times, etc. Note the "feet on center" below each picture. That is how many feet should be between the center of one plant and the center of the next closest plant. Draw the center of your plant, then the center of the next closest plant and then make each plant as big of a circle as possible. Use the grids as a guide and see the examples for each plant spacing on the "Recommended Native Plants" page.
- Draw each plant species in a different color. Then code each species on the worksheet so anyone looking at your design will know what each color represents.

Present
- invite a few students to present their rain garden designs in front of the class in the last 5-10 minutes of class.

6th GRADE ADDITION

SUPPLIES
-aerial map of house and yard. include contour lines, soil type and square footage of roof. mapwashtenaw.ewashtenaw.org

ADDITIONAL COMPONENTS
Follow directions on the worksheet to have students figure out their site characteristics based on the aerial image.

Design a Rain Garden

worksheet one | Created by the Washtenaw County Water Resources Commisisoner's Office with funding in part from the Community Foundation for Southeast Michigan

GL 2-3

Name: _____

1. Draw a rain garden shape. One square = 1 square foot.
How wide is your rain garden? _____ feet
How long is the rain garden? _____ feet

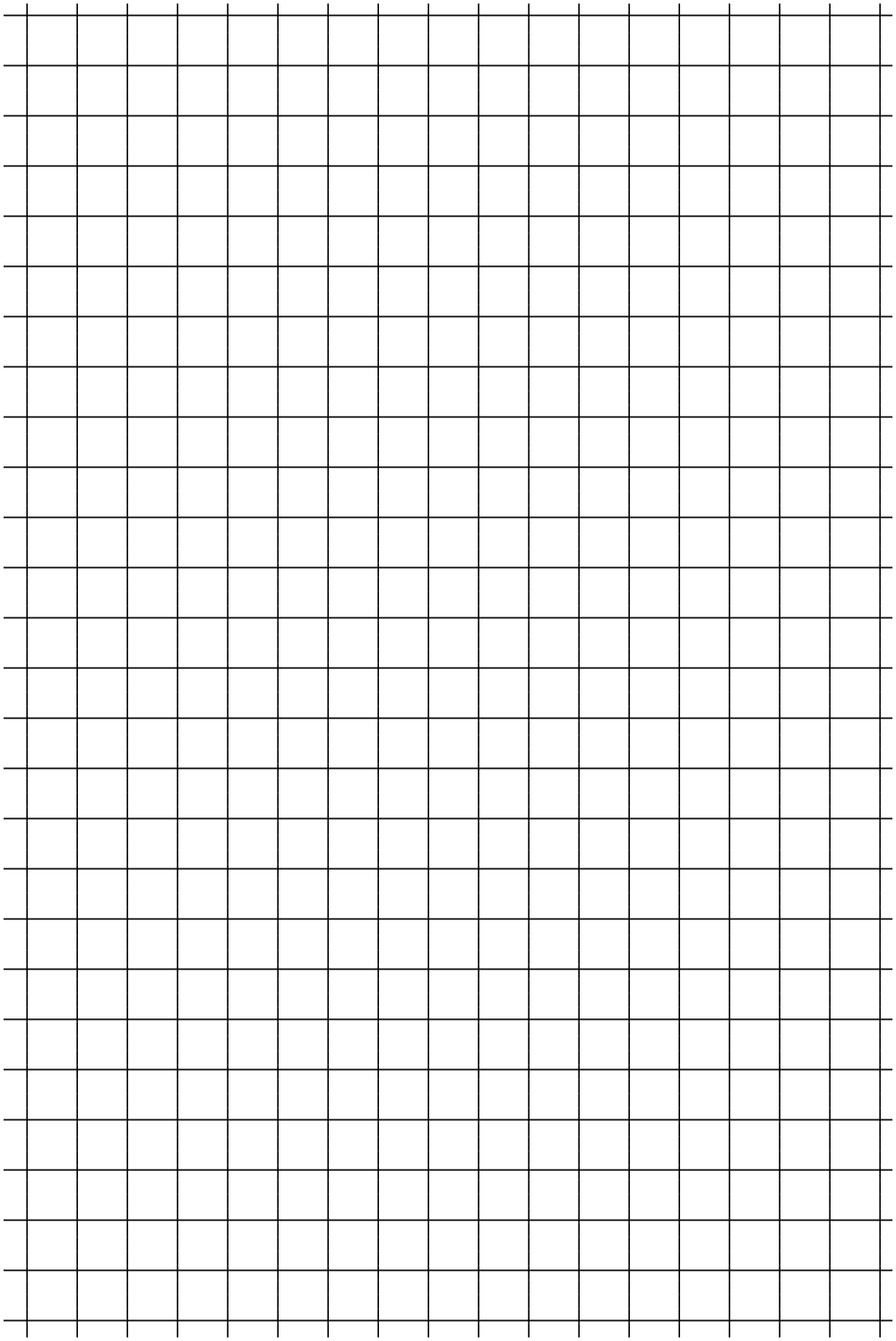
2. Select the plants from the Native Plants page. Choose plants with a variety of color, bloom time and animal companions.

3. Draw your plants into your rain garden. Note how tall your plant is. If your plant is one foot tall, then draw your plant as a circle that covers about 1 square foot (one box).

4. How many plants will you need? Count the number of each plant species and write it down below. Label each plant by their color.

color	Plant Name	Number of plants

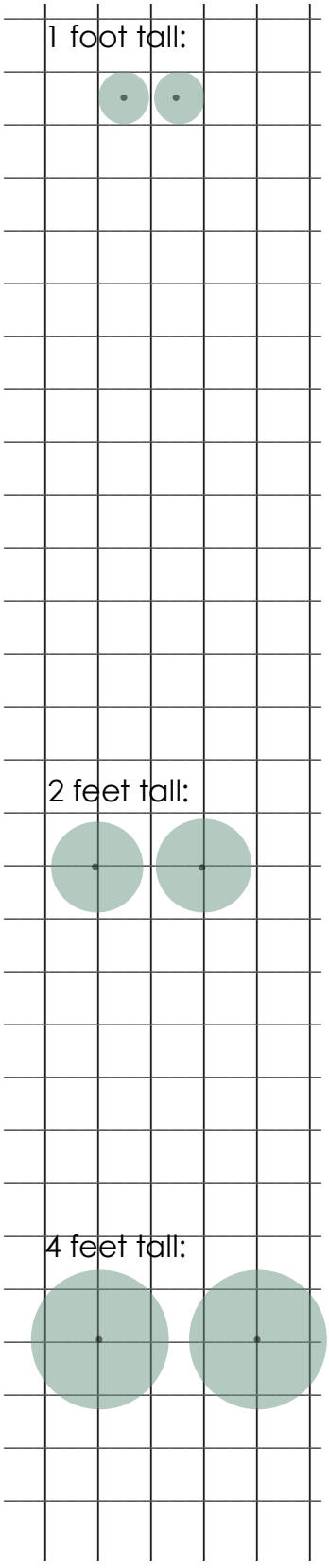
Total Number of Plants: _____



RECOMMENDED NATIVE PLANTS

These are the top native Michigan plants used successfully in Washtenaw County rain gardens.

GL 2-3



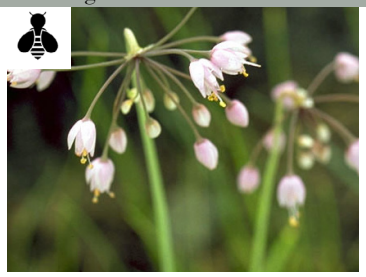
Canada anemone *Anemone canadensis*

Spring |1foot tall

Wild geranium *Geranium maculatum*

Spring | 1 foot tall

Nodding wild onion *Allium cernuum*

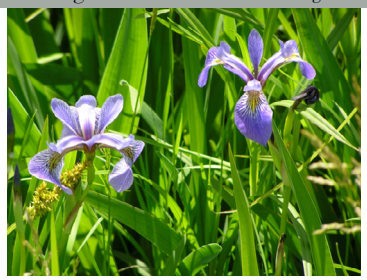


Fall| 1 foot tall

Wild strawberry *Fragaria virginiana*

Spring | 1 foot tall

Blue flag iris *Iris virginica*



Spring | 1 foot tall

Black-eyed susan *Rudbeckia fulgida*

Summer | 1 foot tall

Sensitive fern *Onoclea sensibilis*

No bloom | 2 feet tall

Pink turtlehead *Chelone lyonii*

Summer| 2 feet tall

Purple coneflower *Echinacea purpurea*

Fall | 2 feet tall

Rose Mallow *Hibiscus moscheutos*

Fall | 4 feet tall

Switch grass *Panicum virgatum*

Fall| 4 feet tall

Goldfinger potentilla *Potentilla fruiticosa*

Spring | 4 feet tall

Design a Rain Garden

worksheet one | Created by the Washtenaw County Water Resources Commisisoner's Office with funding in part from the Community Foundation for Southeast Michigan

GL 4-5

Name: _____

1. Draw a rain garden shape. One square = 1 square foot.
How wide is your rain garden? _____ feet
How long is the rain garden? _____ feet

2. Select the plants from the Native Plants page. Choose plants with a variety of color, bloom time and animal companions.

3. Draw your plants into your rain garden. Note how much space each plant needs. If it says 1.5 feet on center then there should be 1.5 feet between the center of your plant and the center of the next closest plant. Draw plants as circles and use the grid lines to guide you.

4. How many plants will you need? Count the number of each plant species and write it down below. Label each plant by their color.

color	Plant Name	Number of plants
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Total Number of Plants: _____

If plants cost $2 each, how much will your rain garden plants cost? (total number of plants X 2 = cost)

Total Cost of Plants:_____

RECOMMENDED NATIVE PLANTS

These are the top native Michigan plants used successfully in Washtenaw County rain gardens.

GL 4-5

1 foot on center:

2 feet on center:

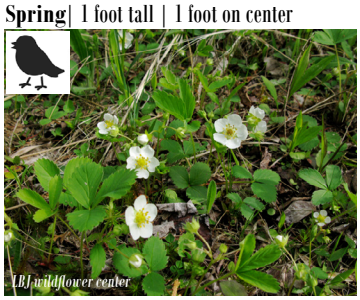
3 feet on center:

Canada anemone *Anemone canadensis*

Spring| 1 foot tall | 1 foot on center

Wild strawberry *Fragaria virginiana*

Spring| 1 foot tall | 1 foot on center

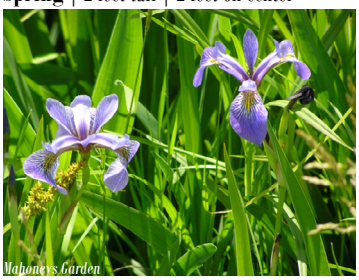


Nodding wild onion *Allium cernuum*

Fall | 1feet tall | 1 foot on center

Blue flag iris *Iris virginica*

Spring | 2 feet tall | 2 feet on center



Wild geranium *Geranium maculatum*

Summer | 1 foot tall | 2 feet on center

Black-eyed susan *Rudbeckia fulgida*

Fall | 2 feet tall | 2 foot on center

Sensitive fern *Onoclea sensibilis*

No bloom | 2 feet tall | 2 foot on center

Pink turtlehead *Chelone lyonii*

Fall | 3 feet tall | 2 feet on center

Purple coneflower *Echinacea purpurea*

Fall | 3 feet tall | 2 feet on center

Rose Mallow *Hibiscus moscheutos*

Fall | 5 feet tall | 3 feet on center

Switch grass *Panicum virgatum*

Summer | 5 feet tall | 3 feet on center

Goldfinger potentilla *Potentilla fruiticosa*

Summer | 4 feet tall | 3 feet on center

Design a Rain Garden

worksheet two

Created by the Washtenaw County Water Resources Commisisoner's Office with funding in part from the Community Foundation for Southeast Michigan

GL 6

Name: _____ Date: _____

1. Determine your site characteristics based on the aerial map that you received. Look for nearby trees or buildings to find sun level.

Sun level: _____ (sun, part sun, etc)

Soil type: _____ (clay, loam, sand)

2. Decide where your rain garden should be located on the map. Make sure all buildings are farther than 10 feet from your rain garden and that you maximize the amount of water that will flow into the rain garden. Use the contour lines on your aerial to figure out how water will flow. Draw your rain garden on the aerial map.

3. Calculate the size that your rain garden should be. If you have loam or sand soils, the rain garden should be 20% the size of the area draining into the garden (multiply by 0.2). If you have clay soils, the rain garden should be 40% (multiply by 0.4) the size of the area draining into the garden.

Area draining into rain garden: _____ square feet

Area of rain garden: _____ square feet

3. Draw your rain garden on graph paper and any nearby features, like sidewalks or buildings. Draw your garden to scale. 1 square is 1 square foot so if your garden is 400 square feet, there should be 400 squares in your rain garden. The shape of the garden is up to you.

4. Select your plants. Choose plants that will work for the sun level needed and have a variety of bloom times, heights and animal companions. Note how much space each plant needs. If it says 1.5 feet on center then there should be 1.5 feet between the center of your plant and the center of the next plant. Draw plants as circles and use the grid lines to guide you.

5. How many plants will you need? Count the number of each plant species and write it down below. Label each plant by their color.

color	Plant Name, ie: Canada anemone	Number of plants

Total Number of Plants: _____

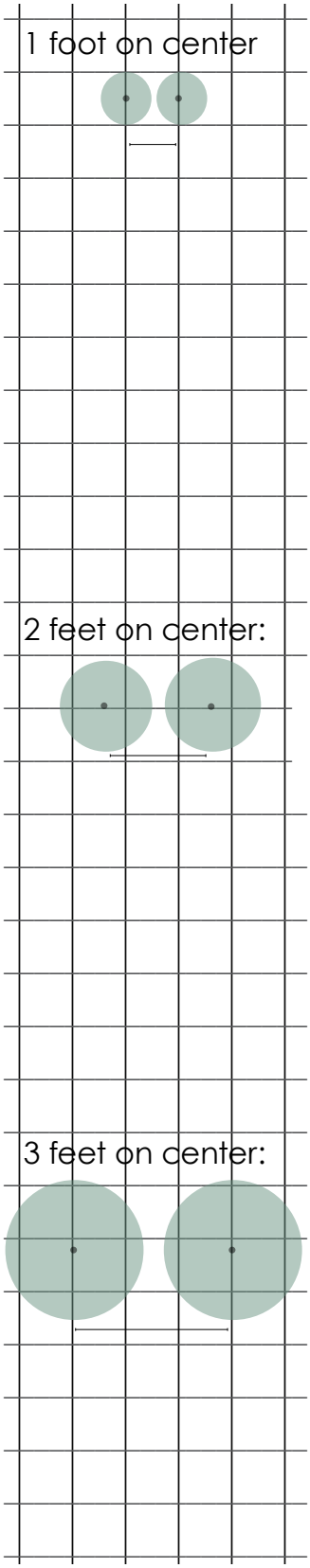
If plants cost $2 each, how much will your rain garden plants cost?

Total Cost of Plants:_____

RECOMMENDED NATIVE PLANTS

These are the top native Michigan plants used successfully in Washtenaw County rain gardens.

GL 6



Canada anemone *sun, part sun, shade*

May - June | 1 foot tall | 1 foot on center

Sensitive fern *sun, part sun, shade*

No bloom | 2 feet tall | 1 foot on center

Nodding wild onion *sun, part sun*

Sep - Oct | 1 foot tall | 1 foot on center

Wild strawberry *sun, part sun, shade*

May - June | 1 foot tall | 1 foot on center

Fox sedge *Csun, part sun, shade*

May | 2 feet tall | 1 foot on center

Black-eyed susan *sun, part sun*

July - Sept | 2 feet tall | 1 foot on center

Wild geranium *sun, part sun, shade*

May - June | 2 feet tall | 2 foot on center

Pink turtlehead *sun, part sun*

Aug - Sep | 3 feet tall | 2 feet on center

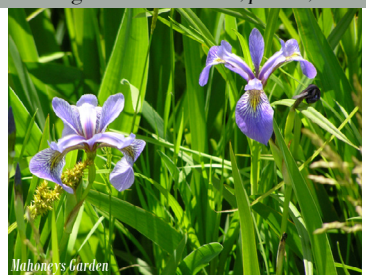
Purple coneflower *sun, part sun*

Sep - Oct | 3 feet tall | 2 feet on center

Blue lobelia *sun, part sun, shade*

July - Sep | 2 feet tall | 2 foot on center

Blue flag iris *sun, part sun, shade*



May - June | 2 feet tall | 2 feet on center

Goldfinger potentilla *sun*

June-July | 4 feet tall | 3 feet on center

Rose Mallow *sun*

August - Sept | 5 feet tall | 3 feet on center

Switch grass *sun*

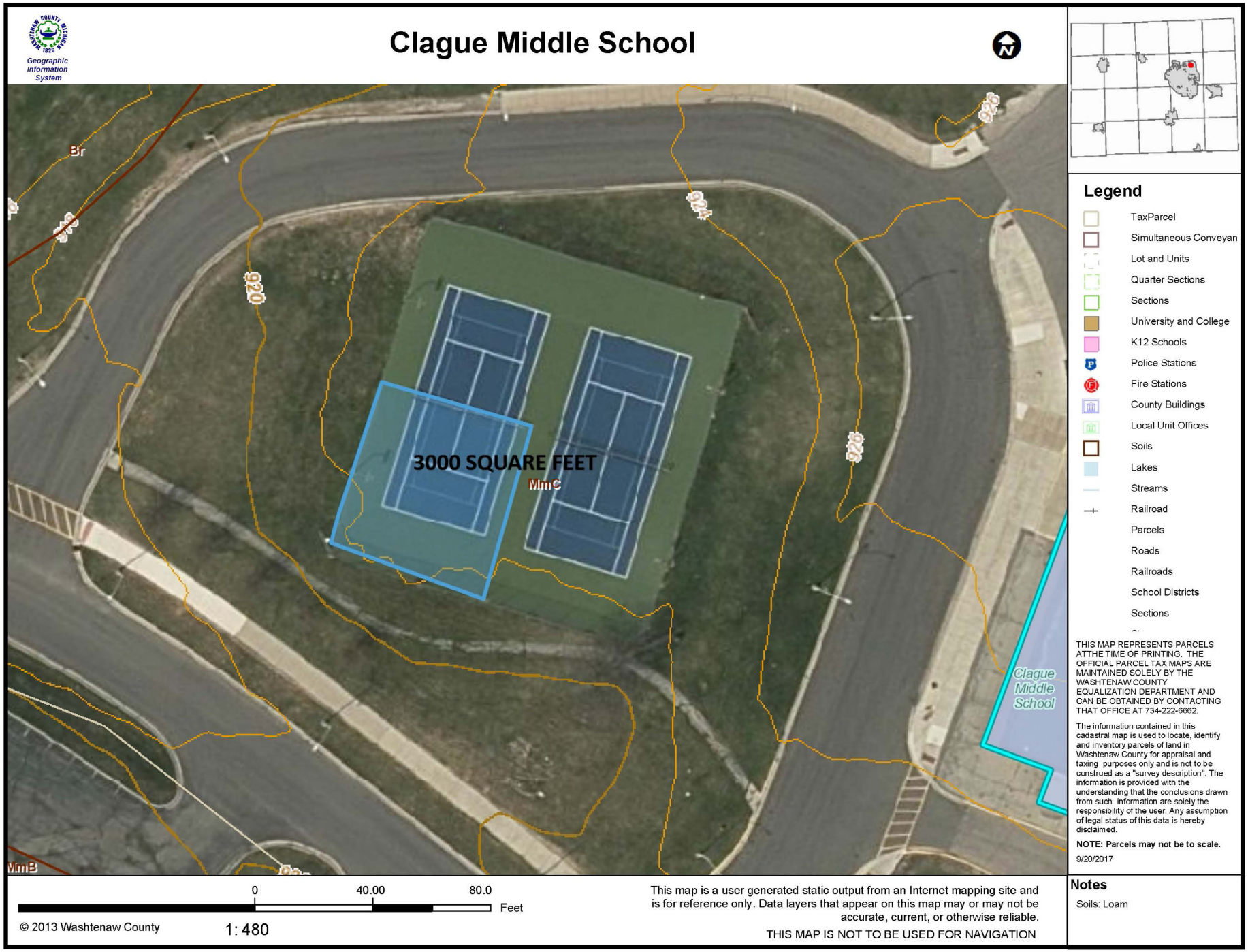
Aug-Sept | 5 feet tall | 3 feet on center

Redbud Tree *sun, part sun, shade*

May | 25 feet tall | 20 feet on center

Name: _____ Date: _____

Name: _____ Date: _____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Geographic Information System
3000 SQUARE FEET
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Lot and Units
Quarter Sections
Sections
University and College
K12 Schools
Police Stations
Fire Stations
County Buildings
Local Unit Offices
Soils
Lakes
Streams
Railroad
Parcels
Roads
Railroads
School Districts
Sections
THIS MAP REPRESENTS PARCELS ATTHE TIME OF PRINTING. THE OFFICIAL PARCEL TAX MAPS ARE MAINTAINED SOLELY BY THE WASHTENAW COUNTY EQUALIZATION DEPARTMENT AND CAN BE OBTAINED BY CONTACTING THAT OFFICE AT 734-222-6662.
The information contained in this cadastral map is used to locate, identify and inventory parcels of land in Washtenaw County for appraisal and taxing purposes only and is not to be construed as a "survey description". The information is provided with the understanding that the conclusions drawn from such information are solely the responsibility of the user. Any assumption of legal status of this data is hereby disclaimed.
NOTE: Parcels may not be to scale.
9/20/2017
0
40.00
80.0
Feet
© 2013 Washtenaw County
1: 480
This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.
THIS MAP IS NOT TO BE USED FOR NAVIGATION
Notes
Soils: Loam

Rain Garden Project Factsheet Lesson Plan

Created by the Washtenaw County Water Resources Commisisoner's Office with funding in part from the Community Foundation for Southeast Michigan

OBJECTIVE
Summarize the main lessons learned about rain gardens

GRADE LEVEL (GL)
2nd through 6th grade

SUPPLIES

- Colored pencils or markers
- Worksheet
- Pencil or pen

BACKGROUND

- Students will answer the following questions on the worksheet and draw a side view diagram of a rain garden. Draw an example diagram, like on worksheet 1. Include labels for compost, mulch, plants and anything else that is included, like roots, animals, bees, etc.
- Brainstorm the answers to the following questions:

1) What is a rain garden?

- Focus on the physical qualities of a rain garden - it is bowl shaped so that it can capture and store stormwater
- The garden has a flat bottom so that water can soak in evenly throughout the garden
- There is a layer of compost (2 inches) and mulch (4 inches)
- The whole garden is full of native plants with deep roots

2) Why are rain gardens important?

Clean Water

- Rain gardens capture and store stormwater which slows the water down and lets it soak into the ground
- When stormwater soaks into the ground, it gets cleaned up. Stormwater is usually full of pollutants like fertilizers, pesticides, oil, sediment, etc which it picks up as it moves along hard surfaces like roads and parking lots
- Stormwater gets clean because the soil below us is like a natural filter. There are micro-organisms in the soil that break down the pollutants
- Without rain gardens the dirty stormwater would usually go into the stormdrain and directly to the river, without ever being filtered. This can hurt the animals who live in the rivers, and us!

Habitat

- Rain gardens are also full of native plants so are good habitat for birds, bees, insects, frogs, etc.

Reduce Puddling

- Rain gardens hold stormwater in one place so they can reduce puddling in or around the home

3) How can we care for our rain garden?

- Water during the first summer
- Weed regularly and remove trash
- Don't step on the plants
- Trim back plants in the winter

- Take the best factsheets and photocopy them for the school's staff so that they know what the new rain garden is all about!

Name_____

Schoolyard Rain Garden

Community Foundation

FOR SOUTHEAST MICHIGAN

The schoolyard rain garden project was coordinated by the Water Resources Commissioner's Office and funded by the Community Foundation for Southeast Michigan. For more information or to volunteer, contact Catie Wytychak at (734) 222-6813 or wytychakc@ewashtenaw.org.

PART 3:
BUILDING A RAIN GARDEN

Digging demonstration at Summers-Knoll School, Spring 2017

SITE PREPARATION

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

2) Add a flag garden border into the ground in the measured locations from your 'point of beginning'

3) Define the border with string or spray paint

4) On the planting day, string and stakes can also be used to divide up the rain garden into planting zones. Each class or group could be assigned to plant a certain species within a planting zone.

Students can do this exercise a day in advance to work on graphing and mapping skills

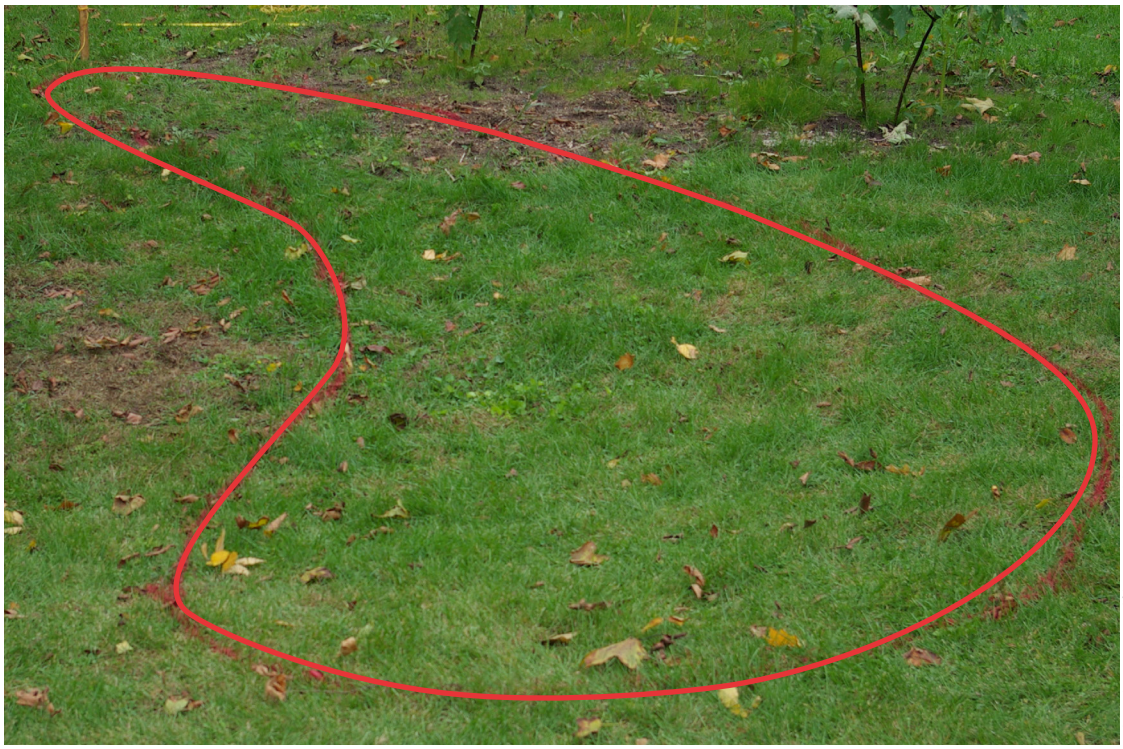


Photo credit: Harry Sheehan

DIGGING WORKDAY

With a group of 20-30 adults, a 400 square foot rain garden can be hand dug in about 3 hours. Always call Miss Dig two weeks before the workday to make sure there are no underground utilities that could be impacted by digging about 8" deep. Schedule a rain date in case of inclement weather.

1) Remove the turf grass in squares with spades. Place squares directly into a wheelbarrow and then dump them into a pile near a low or bare area of the playground.

2) Dig the rain garden depth down to between 5 and 8 inches, depending on how deep you want water to pool. If you want water to pool at 3 inches (clay soils), then dig 5 inches. Sites with better soils can dig down to a maximum depth of 8 inches, to then have water pool at 6 inches. The bottom of the rain garden should be level. If the garden is on a slope, use the fill dirt to build a berm on the downhill side to hold the water like a bowl. 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.

3) Move the remaining fill dirt into wheelbarrows and then spread it smoothly into low or bare areas of the playground. It is best to first rough up these bare spots with a rototiller or shovel. Lay the turf grass squares on top of the fill dirt, squeezing the squares as close together as possible. If there is bare soil, scatter grass seed and then roll out and pin a soil erosion blanket. Water thoroughly.

4) Use wheelbarrows and rakes to move the compost pile and then spread it smoothly to a depth of 2 inches. Rototill the compost into the native soil until it appears well mixed. If this does not happen then the soil can be too rich and damage the new plants. If topsoil is used, it also must be mixed thoroughly so that the new plant roots don't become 'stuck' in the good soil and never grow into the native soils.

5) If two classes or fewer will be planting the rain garden, have the volunteers spread the mulch over the compost. Use wheelbarrows and rakes to move the mulch pile and then spread it smoothly to a depth of 2 to 4 inches.

Site Preparation
(for both digging & planting days)

- ☐ Design & plant list
- ☐ Tape Measure
- ☐ Line Level
- ☐ String
- ☐ Wood stakes

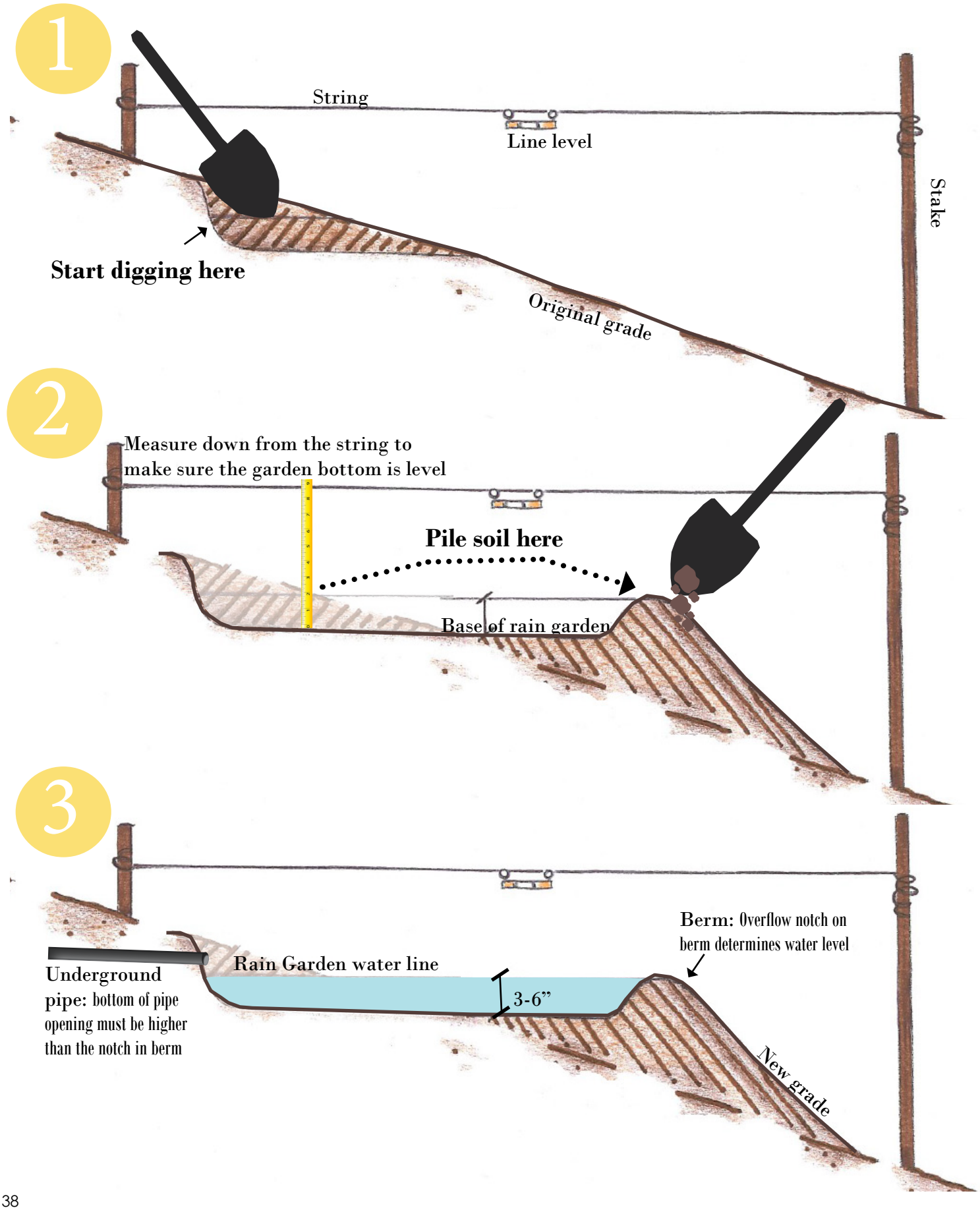
Digging

- ☐ Shovels
- ☐ Rakes
- ☐ Rototiller
- ☐ Wheelbarrows
- ☐ Tape Measure
- ☐ Line Level
- ☐ String
- ☐ Wood stakes

Planting

- ☐ Shovels
- ☐ Rakes
- ☐ Trowels
- ☐ Wheelbarrows
- ☐ Tape Measure
- ☐ String
- ☐ Wood stakes

DIGGING ON A SLOPE



PLANTING WORKDAY

During the workday, first divide the students into different groups: plant preparers, planters and mulchers. If you only have two classes, it is better to mulch the rain garden during the digging workday. In this case, students will just plant and water.

Plant Preparers- carefully remove plant plug from plastic tray by squeezing around the bottom of the tube and gently pulling at the base of the stem. The tray should be held so that the plant is horizontal to the ground. Break apart the roots of the plant. In some cases, the plant will be so rootbound that you have to use a shovel to break apart the roots. If the roots are not torn apart and loosened, then the plant will not grow new roots when planted in the soil.

Planters- dig a hole that is about as deep as the plug. If the garden is already mulched, the mulch will need to be moved to the side into a pile. The soil moved out of the hole will also need to be made into a pile (to be used again). Place the plug upright into the hole. Fill in around the plug with the old soil, pressing down so that the plug is snug. Smooth the mulch around the plug.

Mulchers- spread mulch 2-4 inches thick throughout the rain garden. This can be done by all students at the beginning of the workday, or piece by piece by smaller groups each class. I find it easier to spread the mulch and then plant, but some prefer to plant and then spread mulch. Mulch is important in keeping weeds out and keeping water in. Mulch also slowly decomposes and adds nutrients into the soil. This group can also water each plug for about 5 second with a hose.

PART 3: MAINTAINING A RAIN GARDEN

students pulling weeds from a rain garden

WATERING & TRANSPLANTING

Watering- water over the first summer. If the garden was planted in the spring, water 1-2 times per week for about 1 hour each time (unless it rains) or 1 inch per week.

If planted in the fall, water 1 inch per week (unless it rains) through late October and in July and August of the following summer.

Test how wet the soil is by putting your pointer finger into the soil past your knuckle. If the soil is moist at that depth, then you don't need to water. When watering, about 25 gallons of water is needed for each 100 square feet of rain garden. This can change depending on the amount of sunlight received and soil types.

Transplanting- Replant in bare areas as needed. Large plants can be divided and transplanted to fill bare areas. Some plants that can be divided and transplanted include Blue Flag Iris, Canada Anemone, Switchgrass and Wild Strawberry.

When dividing these plants, a shovel can be used to dig up a section of the plant. Include about 6 inches of root and dirt when moving the plant. Dig a new hole for the plant that is large enough for the roots and old dirt. Make sure to press down around the new transplant to reduce the amount of air pockets in the soil.

Watering

- ☐ water key
- ☐ hose
- ☐ sprinkler

Transplanting

- ☐ shovels
- ☐ gloves
- ☐ wheelbarrows

Planting

- ☐ hand trowels
- ☐ gloves
- ☐ wheelbarrows

left: UM Ginsberg Center volunteers at Erickson
above: Steward Frank planting shrubs at Thurston Elementary School.
Photo credit: Linda Prieskorn

WEEDING

Herbaceous plants

colors indicate when plants should be targeted for removal

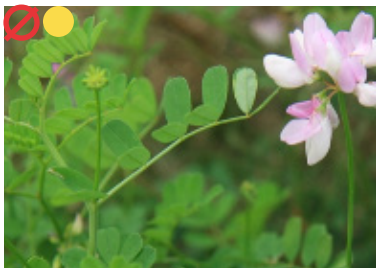
Bull Thistle- dig out

Bittercress- hand pull

Burdock- dig out

Canada Thistle- hand pull

Chicory- hand pull



Crown Vetch- hand pull/herbicide

Curly Dock- dig out

Dandelion- hand pull

Dames Rocket- hand pull

Field Bindweed- hand pull/herbicide

Garlic Mustard- hand pull

Japanese Knotweed- herbicide

Leafy Spurge- herbicide

Narrow-leaved Cat-tail- herbicide

Phragmites- herbicide

Plantain- hand pull

Purple Loosestrife- herbicide

Ragweed- hand pull

Reed Canary Grass- dig out

Teasel- dig out

spring **summer** **fall** **∅ leave to be herbicided by a certified applicator**

WEEDING (CONTINUED)

Sow Thistle- hand pull

Spotted Knapweed- herbicide

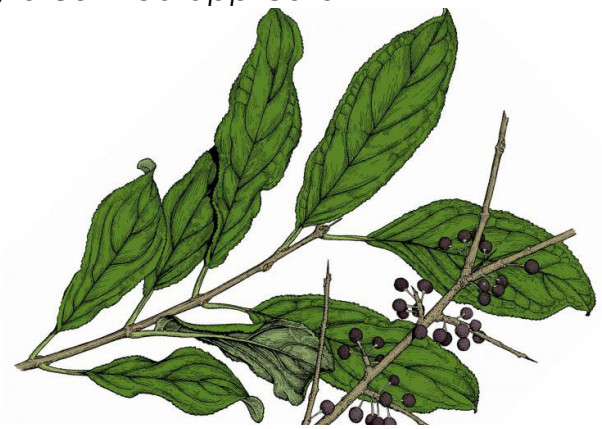
Yellow & White Sweet Clover- cut

Queen Anne's Lace- hand pull

Woody plants

all woodies should be dug out or cut and herbicided by a certified applicator

Autumn Olive



Buckthorn

Honeysuckle

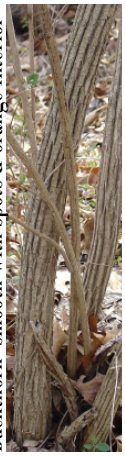
Oriental Bittersweet

Tree of Heaven

BARK

Autumn Olive- smooth and sparkly silver spots

Buckthorn- smooth with spots & orange interior



Honeysuckle- corrugated cardboard, light grey

Bittersweet - vine with black marks, smooth

Tree of Heaven- stretch marks

SEASONAL WORK

Spring- If leaves have accumulated to a depth of more than one foot, then they should be removed so that new plant growth is not suffocated. A controlled burn can be done in early spring, before there is too much green vegetation. This will encourage natives, reduce invasives and eliminate excess leaves.

Late spring is the best time to remove some invasives, see the previous pages for the species labeled in pink. Make sure to remove these invasives before their flowers go to seed and while they are still small.

Mulch can be added to gardens to reduce the amount of weeds. Leaves or cut standing dead vegetation can also be used as a natural (and free) mulch. If a garden is mulched with wood chips, it is not recommended that it be burned for 3 years. When a recently mulched garden is burned, the mulch can smolder and reignite for long periods of time.

If sediment has accumulated at the inlet of the rain garden, remove it with a shovel and dispose of it in a trash can. This sediment can not be composted because it has heavy metals in it.

During one volunteer workday, a 400 square foot rain garden can likely be weeded, mulched and leaves/ sediment can be removed with two or three classes of students.

Summer- If the rain garden is planted in the spring, it must be watered throughout the first summer (see previous page for watering instructions). During the second summer, the rain garden may need to be watered if there is no rain for more than one week. If the rain garden is planted in the fall, it must be watered during July and August of the following summer if there are periods of prolonged drought.

Throughout the summer, it is important to weed- see the previous page for species labeled in yellow. One visit every two weeks by a volunteer is sufficient.

Fall- If the rain garden is planted in the fall, it is important to check on the plugs after the first freeze/thaw to see if any plugs have popped out of the ground. If they have, plugs can be pushed back into the ground.

Cut back standing dead plants before winter and leave dead stalks on the ground to decompose. This is purely aesthetic. If you want to leave the standing dead plants as they are, that is no problem and can actually provide some habitat structure for wildlife.

The rain garden should be edged to create a clean perimeter and discourage turf grass from entering the garden. The easiest way to maintain a clean edge is to dig straight down along the perimeter of the garden with a flat shovel. Make sure that the bottom of your rain garden remains flat. See photos to the right.

Early fall is the best time to remove some invasives, see the previous pages for the species labeled in blue. Make sure to remove these invasives before their flowers go to seed.

During one volunteer workday, a 400 square foot rain garden can likely be weeded, mulched, edged and the standing dead could be cut down with two or three classes of students.

APPENDIX: SUPPORTING MATERIALS

5th graders preparing plants with a Master Gardener volunteer | Spring 2017
Photo credit: Linda Prieskorn

CLOUD

GROUNDWATER

BIRD HILLS

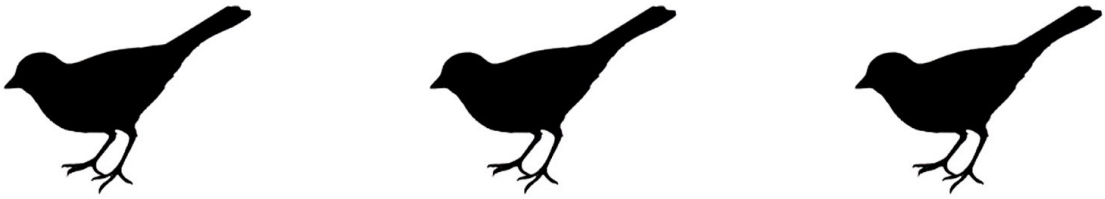
STORMDRAIN

round one

PLANT

HURON RIVER

ANIMAL



RAIN GARDEN

round two

You fall as rain into a stream
GO TO THE HURON RIVER

1. cloud

You fall as rain onto a hill
GO TO BIRD HILLS

1. cloud

You fall as rain into a stream
GO TO THE HURON RIVER

1. cloud

You fall as rain onto a hill
GO TO BIRD HILLS

1. cloud

You fall as rain and roll into the stormdrain
GO TO THE DRAIN

1. cloud

You fall as rain and roll into the stormdrain
GO TO THE DRAIN

1. cloud

You move slowly underground and flow into a stream
GO TO THE HURON RIVER

1. groundwater

A plant takes you in through its roots
GO TO PLANT

1.groundwater

You move slowly underground and flow into a stream
GO TO THE HURON RIVER

1. groundwater

A plant takes you in through its roots
GO TO PLANT

1. groundwater

A plant takes you in through its roots
GO TO PLANT

1. groundwater

You move slowly underground and flow into a stream
GO TO THE HURON RIVER

1. groundwater

You fall as rain and roll into the stormdrain
GO TO THE DRAIN

1. hill

A plant takes you in through its roots
GO TO PLANT

1. hill

You fall as rain and roll into the stormdrain
GO TO THE DRAIN

1. hill

You roll downhill and enter a stream
GO TO THE HURON RIVER

1. hill

You roll downhill and enter a stream
GO TO THE HURON RIVER

1. hill

You soak into the ground
GO TO GROUNDWATER

1. hill

You move quickly through a drain and fall into the stream **GO TO THE HURON RIVER**

1. drain

You move quickly through a drain and fall into the stream **GO TO THE HURON RIVER**

1. drain

You move quickly through a drain and fall into the stream **GO TO THE HURON RIVER**

1. drain

You move quickly through a drain and fall into the stream **GO TO THE HURON RIVER**

1. drain

You move quickly through a drain and fall into the stream **GO TO THE HURON RIVER**

1. drain

You move quickly through a drain and fall into the stream **GO TO THE HURON RIVER**

1. drain

You evaporate into the air
GO TO THE CLOUD

1. plant

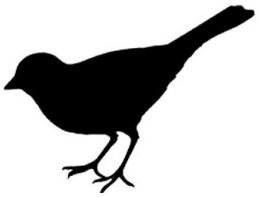
The plant uses you to grow
ROLL AGAIN

1. plant

You fall down an old root tunnel
GO TO GROUNDWATER

1. plant

You are in the plant's fruit & a bird eats you
GO TO ANIMAL

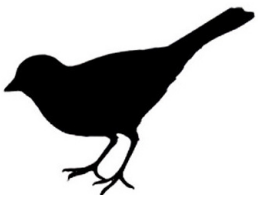


1. plant

The plant breaths you into the air as vapor
GO TO CLOUD

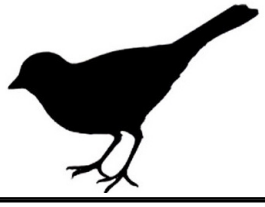
1. plant

You are in the plant's fruit & a bird eats you
GO TO ANIMAL



1. plant

An animal comes to the stream and drinks you up
GO TO ANIMAL



1. river

A plant uses you to grow
GO TO PLANT

1. river

You evaporate into the air
GO TO CLOUD

1. river

You seep into the ground
GO TO GROUNDWATER

1. river

You evaporate into the air
GO TO CLOUD

1. river

You flow downstream
ROLL AGAIN & STAY IN HURON RIVER

1. river

After drinking you, a bird pees and you end up in a stream

GO TO THE HURON RIVER

1. animal

After drinking you, a bird pees and you land on a hill

GO TO BIRD HILLS

1. animal

You are exhaled from the bird's lungs into the air as vapor

GO TO THE CLOUD

1. animal

After drinking you, a bird pees and you end up rolling into the stormdrain

GO TO THE DRAIN

1. animal

You are exhaled from the bird's lungs into the air as vapor

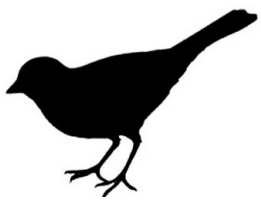
GO TO THE CLOUD

1. animal

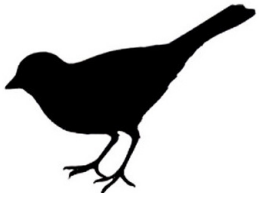
The bird uses you to grow bigger

ROLL AGAIN & STAY IN ANIMAL

1. animal



An animal comes to the stream and licks you up
GO TO ANIMAL



2. river

You overflow into a rain garden
GO TO RAIN GARDEN

2. river

You evaporate into the air
GO TO CLOUD

2. river

You seep into the ground and enter the groundwater
GO TO GROUNDWATER

2. river

You evaporate into the air
GO TO CLOUD

2. river

You flow downstream
ROLL AGAIN & STAY IN THE HURON RIVER

2. river

After drinking you, a bird pees and you end up in a stream
GO TO THE HURON RIVER

2. animal

After drinking you up, a bird pees and you end up on the ground
GO TO BIRD HILLS

2. animal

You are exhaled from the bird's lungs into the air as vapor
GO TO THE CLOUD

2. animal

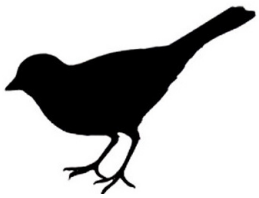
A bird pees and you end up rolling into the rain garden
GO TO THE RAIN GARDEN

2. animal

You are exhaled from the bird's lungs into the air as vapor
GO TO THE CLOUD

2. animal

The bird uses you to grow bigger
ROLL AGAIN & STAY IN THE ANIMAL



2. animal

You fall as rain into a stream
GO TO THE HURON RIVER

2. cloud

You fall as rain onto a hill
GO TO BIRD HILLS

2. cloud

You fall as rain into a stream
GO TO THE HURON RIVER

2. cloud

You fall as rain onto a hill
GO TO BIRD HILLS

2. cloud

You fall as snow onto the street and into the rain garden
GO TO THE RAIN GARDEN

2. cloud

You fall onto the street & into the rain garden
GO TO THE RAIN GARDEN

2. cloud

You move slowly underground and flow into a stream
GO TO THE HURON RIVER

2. groundwater

A plant takes you in through its roots
GO TO PLANT

2. groundwater

You move slowly underground and flow into a stream
GO TO THE HURON RIVER

2. groundwater

A plant takes you in through its roots
GO TO PLANT

2. groundwater

A plant takes you in through its roots
GO TO PLANT

2. groundwater

You move slowly underground and flow into a stream
GO TO THE HURON RIVER

2. groundwater

You evaporate into the air
GO TO THE CLOUD

2. hill

You soak into the ground and get absorbed by roots
GO TO PLANT

2.hill

You fall downhill into a parking lot and into the rain garden
GO TO THE RAIN GARDEN

2. hill

You freeze in ice and are trapped until you thaw
STAY ON HILL AND ROLL AGAIN

2. hill

You fall downhill into a parking lot and into the rain garden
GO TO THE RAIN GARDEN

2. hill

You soak into the ground
GO TO GROUNDWATER

2. hill

You soak into the ground
GO TO GROUNDWATER

2. rain garden

A bird comes by and drinks you up
GO TO ANIMAL

2. rain garden

You soak into the ground and get absorbed by roots
GO TO PLANT

2. rain garden

You soak into the ground and get absorbed by roots
GO TO PLANT

2. rain garden

You soak into the ground
GO TO GROUNDWATER

2. rain garden

You soak into the ground
GO TO GROUNDWATER

2. rain garden

You evaporate into the air
GO TO THE CLOUD

2. plant

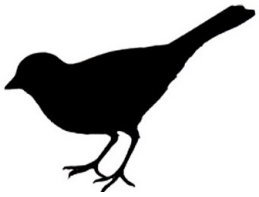
The plant uses you to grow
STAY AT PLANT AND ROLL AGAIN

2. plant

You fall through the soil alongside the roots
GO TO GROUNDWATER

2. plant

The plant stores you in its fruit, and a bird eats you
GO TO ANIMAL

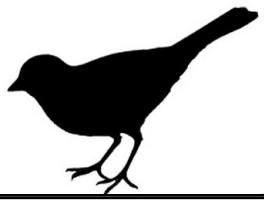


2. plant

The plant breaths you into the air as vapor
GO TO CLOUD

2. plant

The plant stores you in its fruit, and a bird eats you
GO TO ANIMAL



2. plant

Additonal Resource Guides

1. Washtenaw County Rain Garden website
www.washtenaw.org/raingardens

2. Washtenaw County sample gardens for different light and soil requirements

3. "The Blue Thumb guide to Rain Gardens: Design and Installation for Homeowners in the Upper Midwest". Rusty Schmidt, Dan Shaw, and David Dods. Available by emailing: raingardens@yahoo.com, via Amazon or from the Minnesota Sea Grant

4. Rain garden iPhone App, by UCONN, CT Sea Grant, Connecticut Cooperative Extension & CLEAR program. You must choose a state and Michigan isn't listed as an option so choose Connecticut

5. Rain Garden Manual – Ohio County Rain Garden Manual

6. Wisconsin Extension Pamphlet - Rain Gardens, a How To Manual for Homeowners

7. "Lakescaping for Wildlife" Minnesota Department of Natural Resources. Available via Amazon, or directly from the Minnesota State Bookstore

8. Rain Garden Forum: www.wildlifegardeners.org
tinyurl.com/MRGforum