

A Rain Garden “How To” Manual for Homeowners



The sponsors of this event are the City of Lafayette, the City of West Lafayette, and the Tippecanoe Soil and Water Conservation District. This program was also made possible through a Clean Water Indiana grant.

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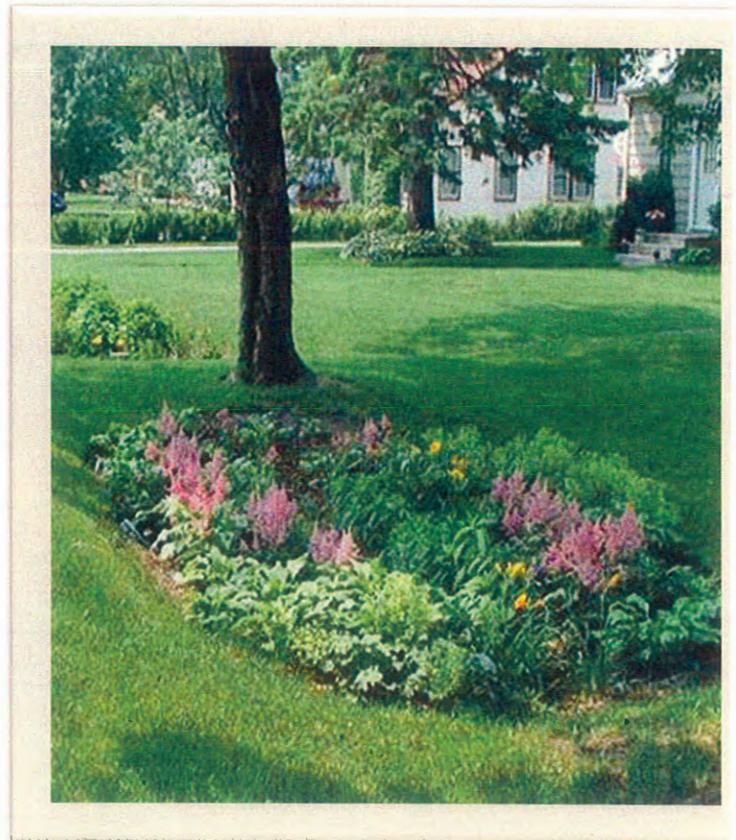
Appendix A

Appendix B

1.0 INTRODUCTION

Our landscape has changed significantly over the past hundred years. Urban and suburban development continues to alter the natural landscape that historically defined our region. Increasing amounts of rooftop, roadway and other paved surfaces, and the introduction of non-native plants have led to an increased amount of stormwater runoff. More runoff means more pollution can be carried into our waterways because we have reduced nature's ability to infiltrate – or soak – rain water runoff into the ground. Rain gardens can be an important way to reduce water pollution caused by flooding and increased stormwater runoff that carries surface pollutants into storm sewers and then into streams and other water bodies. Rain gardens can also help to reduce the amount of stormwater that enters combined sewer system, causing sewage to be discharged to our river during wet weather.

Rain gardens are man-made landscape features where stormwater runoff is allowed to collect and pond for a short period of time. Native perennial plants are typically used in a rain garden because they are hardy and they come back year to year. Rain gardens can actually help to filter some pollutants out of rainwater runoff while their roots help water soak into the ground naturally.



1.1 PURPOSE

This manual is intended to provide basic information about rain garden planning, planting and maintenance. It is meant to be used as a workbook for and supplement to the homeowner "how to" workshops.

1.2 WHY RAIN GARDENS MATTER

As Lafayette/West Lafayette and other areas continue to grow, new development continues to replace green space with impervious surfaces such as rooftops, paved streets and parking lots. Impervious areas do not allow water to soak – or infiltrate – into the ground, so they contribute to stormwater runoff.

Even the construction activity on developing sites can compact the ground, limiting its capacity to absorb water. Stormwater runoff coming from developed areas can be a significant source of pollution. The runoff from rain, and even melting snow, can carry contaminants into streams, lakes and rivers. Water pollution can be traced to our own homes and yards. A



modest home on a small lot may produce over 1,000 gallons of runoff from one-inch of rainfall. As water runs off the roof, driveway, patio and even compacted lawn, it picks up contaminants such as fertilizer, pesticides, bacteria from pet waste, grass clippings and other yard debris. One of the ways you can help to keep these pollutants out of our river and streams is by planting a rain garden. Stormwater runoff has another significant impact in parts of Lafayette/West Lafayette. The amount of stormwater that goes into some of our sewers can cause sanitary sewage to be discharged into the Wabash River. The older sewers in

Lafayette/West Lafayette are combination sewers, so until those sewers can be replaced, we must try to limit the amount of storm water that goes into them. When it is not raining, these sewer pipes carry sanitary sewage to the Wastewater Treatment Centers for treatment. However, when it rains, these same pipes must carry stormwater runoff, too. Rain gardens can help reduce the amount of stormwater going into these combined sewers so that less sewage is likely to be discharged to the rivers when it rains.

1.3 WHAT IS A RAIN GARDEN?

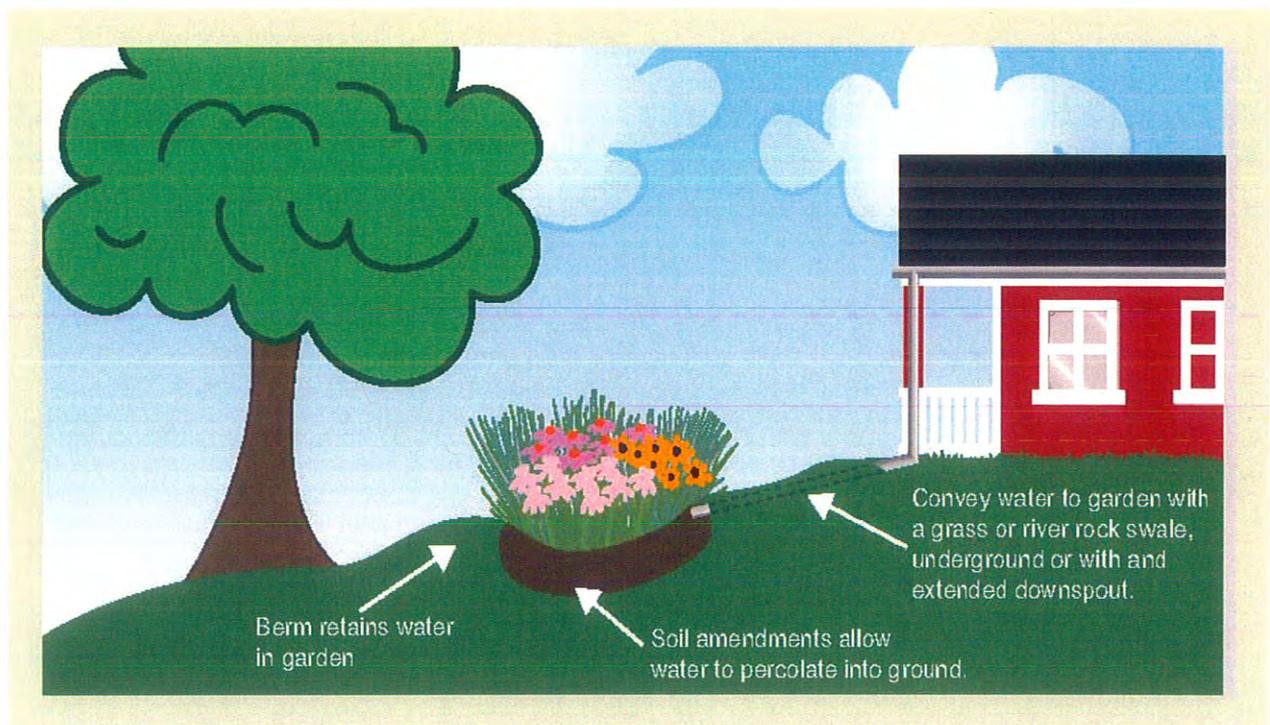
A rain garden is an attractive, landscaped area that is built slightly below the level of your yard. This depression is designed to capture rainwater runoff from impervious areas such as rooftops, roads, sidewalks, driveways and even compacted lawns. Rain gardens are planted with perennial native plants that are selected to tolerate the cycles of rainfall and dry weather that we have here in Central Indiana. The roots of the plants help the soil soak up more water when it does rain, so the amount of stormwater runoff is reduced and what does leave your lot flows more slowly. This helps to prevent soil from eroding. The plants in the rain garden also help to clean the water by filtering out some chemical pollutants from stormwater before it goes into local streams and the river.



Rain gardens may sometimes be used to address yard drainage problems and may help recharge supplies of ground water. In addition to helping control rainwater runoff and the pollutants it can carry, rain gardens are also an attractive addition to a landscaping plan for a yard or community. Rain gardens may provide habitat and food for birds and butterflies. Plants may be selected so that the rain garden has a variety of colors, textures and heights. Plants can be chosen to bloom throughout the spring, summer and fall.



The figure below shows a typical side view profile of a rain garden. Designing and installing a rain garden is not difficult. However, there are some basic design principles that can help ensure a successful and attractive rain garden. Consider this manual to be your step-by-step guide through the process of building an attractive and functional rain garden on your property.



2.0 TECHNICAL TRAINING

2.1 LOCATION & PLACEMENT GUIDELINES

A rain garden can work virtually anywhere. The location, size, and effectiveness depend on the amount of runoff going into the garden, the soil type, and the plants that are used. Areas along driveways or sidewalks and areas that receive runoff from a downspout may be ideal spots for a rain garden, but you can also consider using a corner of your yard as a rain garden location.



When selecting a location, keep the following in mind:

- Locate the rain garden where it will collect the largest possible amount of rainwater runoff.
- Look for a natural depression (low spot in the yard by finding where water already collects or where the runoff flows). Locate the rain garden up-slope from the low spot to interrupt the flow path and divert the water. This will help reduce flow to that area and reduce standing water in your yard.
- Place the rain garden a minimum of 10 feet from your house or building if you have a basement and 4 feet minimum if you are on a slab to prevent water from being drawn to the structure.
- Rain gardens should not be placed over or near the drain field of a septic system or within existing drainage ways, such as a ditch or swale.
- Rain gardens should not be installed near large trees. Trees have extensive root systems that could be damaged as you dig the rain garden. In addition, some trees may not be able to tolerate the extra moisture being held by the rain garden.
- If downspouts do not naturally flow to the area where you plan to locate the rain garden, consider creating a swale or using a plastic pipe (on ground or buried) as a way to route the water to the rain garden location (see Section 2.3.3).
- Place the rain garden downhill from the driveway to collect rainwater runoff from it.
- If you live in a subdivision, be sure to check to make sure your plan does not conflict with neighborhood covenants or zoning regulations.
- Do not locate your garden in an area that may be part of the public right-of-way or utility easement, without getting permission first.
- Before you dig, find out where underground service lines or utilities are located. “Call Before You Dig” - call – 811.



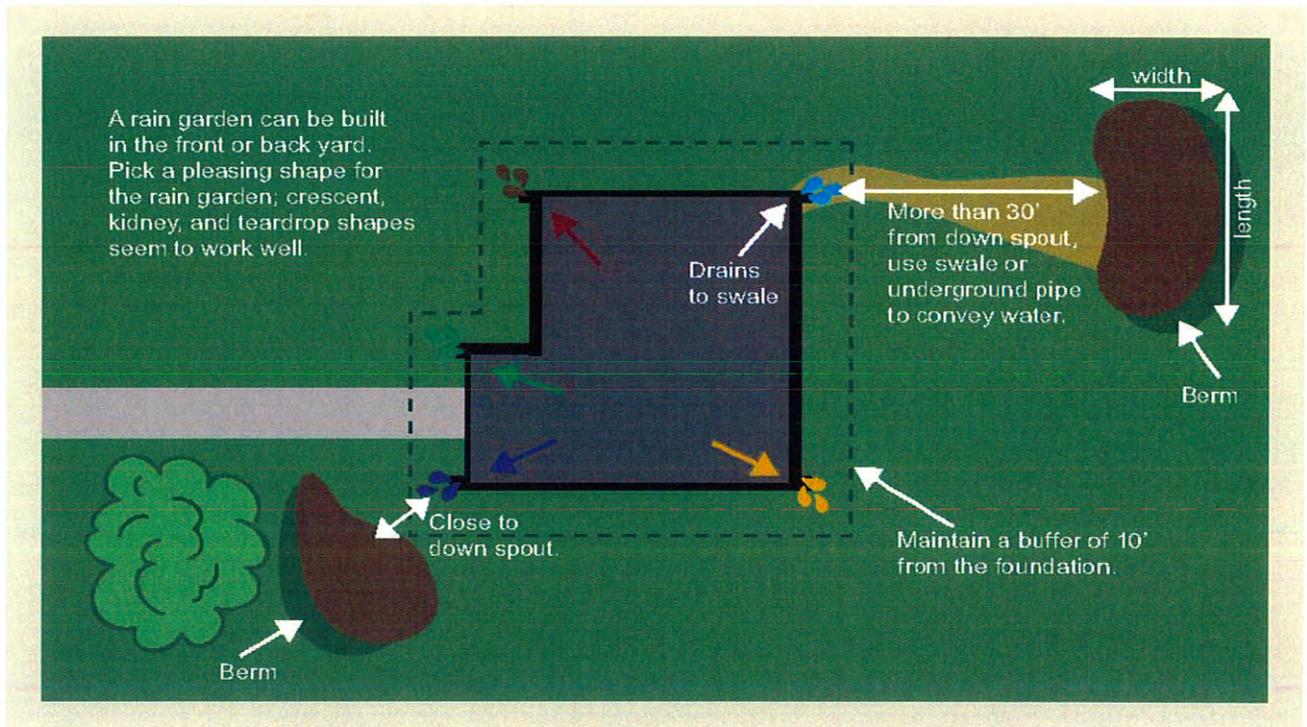


FIGURE 1: SAMPLE SITE FOR LOCATING A RAIN GARDEN

The illustration above can help you determine possible locations for a rain garden on your property (Figure 2).

2.2 DESIGN GUIDELINES

A rain garden can be almost any size and shape. A typical residential rain garden usually covers an area between 100 and 300 square feet.

To determine the optimal size for your rain garden, you will need to consider how much water will be directed into the garden, the kind of soil you have and how deep the garden should be. In this section, you will learn to:

- Calculate the drainage area (Section 2.2.1)
- Consider the soil type (Section 2.2.2)
- Determine appropriate depth (Section 2.2.3)
- Determine garden size (Section 2.2.4)

2.2.1 CALCULATE THE DRAINAGE AREA

In order to determine how much water will go into your rain garden, you will need to determine the size of the area that will drain to the garden. If the rain garden is close to a house or building, most or all of the water going into the garden will come from the rooftop. You will need to measure the rooftop area. You do not need to climb onto the roof. This can be dangerous and there is an easy and accurate way to estimate the rooftop area:

1. Measure the length and width of the house or building (in feet) then multiply the numbers together to determine the approximate area that the house covers. This estimate of the footprint of the building is approximately equal to the size of the roof, in square feet.
2. Count the number of downspouts on the home or building.
3. Divide the roof area (as calculated in #1 above) by the number of downspouts. This will tell you approximately how many square feet of rooftop drain to each downspout.
4. Determine how many downspouts you will route to your garden and multiply this number by the number of square feet calculated in step #3. This will tell you how many total square feet of roof area will drain to the garden.
5. If the rain garden will be located more than 30 feet away from the house or building and downhill from another hard surface (impervious) area, such as a driveway, follow these steps to calculate the drainage area going to the garden:
6. Stand where the garden will be located and look around you to see what part of the lawn or impervious area slopes toward you.
7. Use your garden hose or a string to encircle the area that appears to slope toward the garden spot. Move the hose or string to make a square or rectangle that generally covers the drainage area.
8. The result is the square footage of the contributing area of lawn and/or other impervious surface that will drain to the garden.
9. Add the square footage you just calculated to the rooftop area that will drain into the garden. This is the total drainage area. You will use this number when determining the rain garden size in Section 2.2.4.

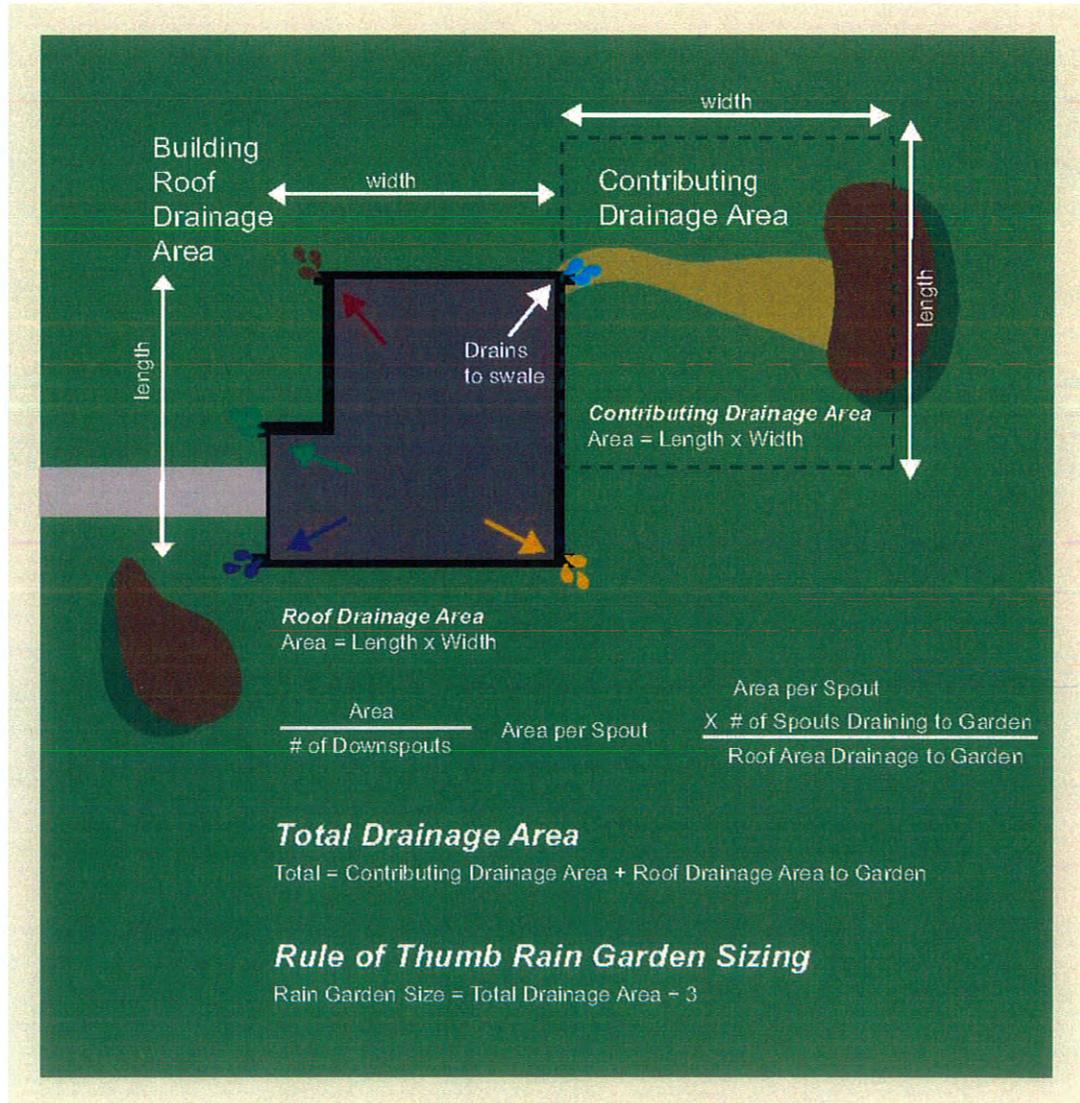


FIGURE 2: DETERMINING DRAINAGE AREA

2.2.2 CONSIDER THE SOIL TYPE

A sandy soil or soil high in organic matter is best suited for a rain garden. However, much of Central Indiana is comprised of clay, sand, silt, and gravel soil. These soils range in particle sizes and may be easily compacted.



There is a simple test you can use to ensure that your soil type will be able to support a rain garden. The test involves digging a small hole about eight inches deep, and grabbing some soil with your hands to determine how it feels.

Squeeze the soil in your hand. If it feels sticky

and clumps together, it is probably a clay soil. Rub some of the soil between your fingers or between the palms of both hands. If the soil feels gritty and coarse, it probably has a high sand content. A silty soil will feel smooth. If you have a clay soil, the soil may not be suitable for a rain garden unless you improve the soil quality or change the size of the rain garden. See Section 2.3.6 about amending the soil.

2.2.3 DETERMINE THE RAIN GARDEN DEPTH

A typical rain garden is between four and eight inches deep, but they can be deeper. However, making the garden deeper may cause water to stand for too long. If the garden is shallower, it will need to be larger to hold the same amount of rainwater runoff.

You will need to conduct an infiltration test to determine how much water your rain garden can absorb and how deep it should be.

1. Dig a hole about the size of a coffee can and approximately eight inches deep.
2. Be sure any loose dirt has been removed from the hole, and then fill it to the top with water.
3. Let the water soak in for a minimum of two hours so that the soil around the hole becomes saturated. The hole does not have to drain completely.
4. Fill the hole back up with water.
5. You will need to measure how much the water level drops in a given time period. You can do this in several ways. One way is to put a stick, stake or paint paddle into the bottom of the hole so that the stick is standing up and extends above the top of the hole. Mark the beginning water level on the stick.

6. Note the time that you are beginning this test.

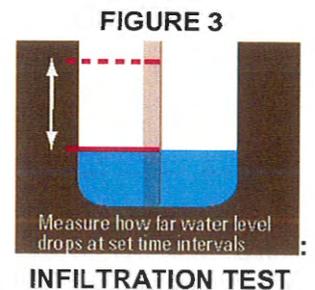
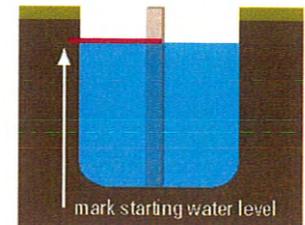
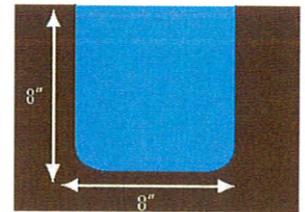
7. Measure how far the water has dropped after several intervals of time. If you have sandy soil and the water level drops quickly, you may need to check the level after 15 minutes, 30 minutes and an hour. If you have clay soil and the water drops slowly, you may need to record the water level after one hour, two hours and four hours. Mark the water level on your measuring stick at the end of each interval.

8. At the end of the test, use a ruler to measure how many inches the water dropped during each interval of time. You may find that the water dropped one inch in two hours in very sandy soil or it may drop one inch in six hours in clay soil. This is the infiltration rate.

9. Based on the rate you have measured, you can determine how many inches of water will soak into the garden in a 24-hour period. If you measured an infiltration rate of one inch in four hours, you can expect that 6 inches of rain could soak in during a 24-hour period. If the infiltration rate is one inch every six hours, you can expect that four inches of rain will soak in during a 24-hour period.

You can use the rate of infiltration per day to determine the optimal depth of the garden. Typically, all of the rain in the garden should absorb within one or two days. Therefore, if you calculated that four inches of rain would be absorbed in 24 hours, your garden should be about four inches deep. In this example, keeping the garden about four inches deep will allow you the most flexibility in selecting plants, because they typically will not be sitting in water for more than a few hours.

In Central Indiana, you will want all of the water in your garden to absorb within one or two days. This will reduce the chance that mosquitoes will breed in the garden and will help ensure that your plants survive. If the infiltration test shows that the water will soak in faster, you can make the garden deeper. If the test shows a slower infiltration rate, you may need to make the garden more shallow, but larger.



2.2.4 DETERMINE THE RAIN GARDEN SIZE

The size of the rain garden, also known as its area (length x width), will depend on how much space you have available, how much rain water runoff you want to capture in the rain garden and the kind of soil that you have. A common approach is to size the rain garden so that it will hold the water that will come from the drainage area (determined above) during a one-inch rainfall. This is not an absolute rule because the amount of space you have available may ultimately determine the size of your rain garden.

To calculate the rain garden size:

1. Divide the number of inches of rainfall that you plan to capture by the depth of the garden (determined in Section 2.2.3). One inch of rainfall capture is a good rule of thumb.
2. Then multiply the result by the drainage area that you calculated in Section 2.2.1. The result is the square footage of the garden.

For example, if the base of your house measures approximately 60 feet across the front and is 30 feet from front to back, the square footage of the roof is approximately 1,800 square feet. If you have four downspouts and only one will be directed to the rain garden, the drainage area will be about a fourth of the roof (or about 450 square feet). If you want to capture one-inch of rain from 450 square feet of drainage area in a garden that is six inches deep, you will need to have a rain garden that is about 75 square feet.

$(1\text{''rain} \div 6\text{'' deep}) \times 450\text{ sq. ft drainage area} = 75\text{ sq. ft rain garden.}$



2.3 BUILDING THE RAIN GARDEN

Once the size and location of the garden has been determined, it is time to start building the rain garden. The following steps outline what tools are needed, rain garden shapes, routing water to the rain garden, how to remove existing lawn turf, digging and leveling the rain garden, amending soil, setting the slope, and constructing the berm.

2.3.1 TOOLS

These tools may be useful when constructing the rain garden. Power tools can make the work easier, but are not essential.

- Tape measure
- Shovel
- Trowel
- Rake
- Carpenter's level
- Stakes or marking flags
- String
- Downspout Extender (optional)
- Power Tiller (optional)
- Landscape Rock (optional)



2.3.2 SHAPE

As mentioned earlier, rain gardens can take a variety of shapes. Crescents, ovals, teardrops and kidney shapes are popular, but the shape of your garden will be determined by the space you have available, the location and your preferences. Once you have determined the appropriate size for your garden, you should choose a shape that best fits your yard and the existing landscape.

To help you shape the garden, mark the perimeter by placing stakes, flags or even a garden hose along the edge of where you want the rain garden to be. Doing this will provide a defined area that you will dig and it will also allow you to better visualize the final size and shape of the rain garden. This is the time to make changes, before you start digging.

2.3.3 ROUTING WATER

If your rain garden will be located more than 30 feet from the home, you may need to plan and construct an arrangement to route water from a downspout to the garden. Although it sounds elementary, remember that water flows downhill, so plan your garden downhill from the water source. Keeping this principle in mind, there are several options for routing runoff from its source to your rain garden:

- Water can be routed to your rain garden through a grassy swale (or a flat grassy channel) that will slow down the water and spread it out as it travels to the garden. This allows for some additional infiltration of the water.
- Another option is to create a creek bed feature or a small waterfall using a rock-lined channel. This can create an attractive “babbling brook” when it rains and can slow down the water going into the garden, dissipating some of its force. A rocky channel requires little maintenance.
- Another option is to use a plastic downspout extender to connect a downspout to the rain garden. If this kind of direct connection is made, almost all of the water coming from the downspout will go directly into the garden, so the garden must be sized correctly. A 4-inch plastic downspout extender can be used effectively and can either be placed on top of the lawn or be buried.
- Regardless of how the water is routed, some kind of diffuser should be used at the point where the water enters the garden so that plants in the immediate area will not be washed out by the force of the water and to prevent erosion. River rocks make an attractive diffusion structure.

2.3.4 REMOVING LAWN TURF

Many rain gardens are constructed in existing lawns. The time and effort it takes to dig out the garden can be reduced by removing the sod first. Sod removal machines are available for rent at some nurseries and tool rental facilities, but a shovel and some hard work can be just as effective. If removed carefully, the turf grass could be reused for patching bare spots around the lawn.

As an alternative, you can cover the lawn where the rain garden will be located with black plastic, several layers of newspaper or any disposable material that will block sunlight. Over a period of about a week, the grass will die and it can then be tilled and mulched into the rain garden soil. This can even be done in the fall so that the area is ready for garden preparation in the spring. If you use this method, it is not necessary to remove the lawn turf.

2.3.5 LEVELING THE GARDEN

Begin by digging into the ground and removing the existing soil from the area where the garden will be located. The garden area should be uniformly deep and have a flat, level bottom. You can check to see if the bottom is level by laying a board across the garden floor with a carpenter's level on top of the board. Move the board around the rain garden floor to find high and low spots. You can add back soil to fill in the low spots and remove additional soil to level out the high spots.

Next, you can use the excess soil to make a berm around the garden area to help contain rainwater runoff. Place the excess soil along the downhill edge and the sides of the rain garden. Keeping the outside edges fairly level will help contain the runoff.

Once you have dug out the entire garden area, you may use a tiller, shovel or hoe to loosen the soil that may have become compacted. This will help to promote deep root growth and infiltration of water.



2.3.6 AMENDING THE SOIL

Now that the garden is dug to the desired depth, you should decide if the remaining soil needs to be amended. If you have light clay soils, mixing in sand and compost will improve the drainage. For ground that is mostly heavy clay, complete removal and replacement of the next 18" – 24" may be needed. A general mixture recommendation is 50% sand, 25-30% compost, and 20-25% good soil. In extreme cases, an underground drain pipe may also need to be installed.

2.3.7 DEVELOPING RAIN GARDEN SLOPE

You have just dug out the footprint of your rain garden. Within this footprint, you will dig a slightly deeper depression with gradually sloping sides. This added depth will allow the rain garden to capture water but remain relatively dry between rainstorms. The sides of the garden should gently slope downward toward the interior of the garden at about a 3:1 ratio. If the ultimate desired depth for the garden is six inches, the side slopes should be at least three times the depth or about 18 inches long (Figure 7). Because different plants may be more or less tolerant of very wet conditions, you can place plants that like drier soil higher up on the slopes and plants that like more water in the deeper part of the garden.

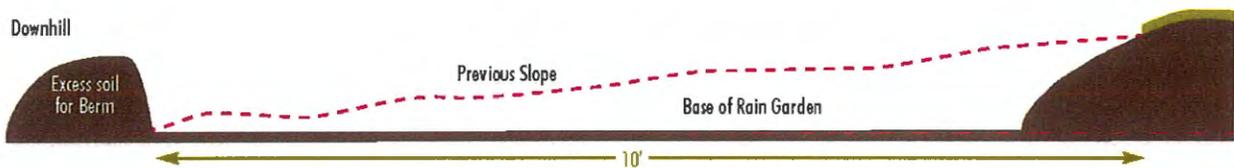


FIGURE 4: EXCAVATING A RAIN GARDEN SLOPE

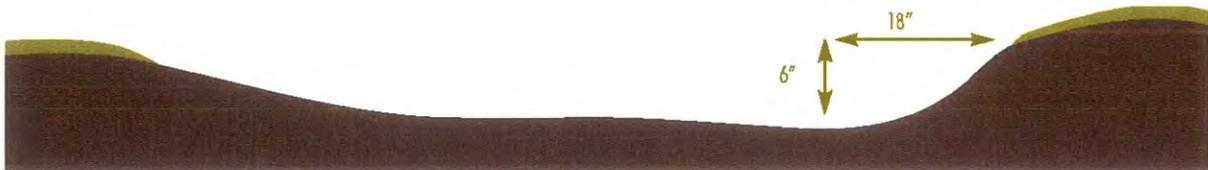


FIGURE 5: SLOPING THE SIDE OF A RAIN GARDEN

2.3.8 BUILDING THE BERM

The soil that is removed from the rain garden location can be used as a berm around the garden. Mound the soil that was removed from the center of the garden around the outside edge of the garden area on the downhill side. This will create a shallow mound or berm on the downhill side of the garden if you are creating a garden on a slope. Extend the berm out and allow it to gradually taper around the sides of the garden. In a flatter yard, you may need to create a berm around the entire garden to help contain water inside.

The berm must be compacted so that it will support the weight of water in the garden. This will also help prevent the berm from eroding if water in



the garden overflows. Use a hand tamp to compact the soil for the berm. Grass seed should be planted, or leftover turf grass from the original excavation should be planted on the berm as soon as possible to limit the amount of erosion from the slopes. The berm can also be covered with mulch to help hold it in place.

2.4 PLANT SELECTION, LAYOUT AND INSTALLATION

Native plant species are recommended for use in a rain garden. These plants have dense and deep growing root systems so more water will soak into the ground. Because they are native to this area, the plants recommended in this manual are adapted to growing conditions in Central Indiana. Once they are well established, these rain garden plants will withstand both frequent dry conditions and periods of time when they may be standing in water. In addition, the plants recommended in this manual are perennials, which means they will come back from year to year. The flowering plants will produce blooms for many years into the future.

There are potentially more than 100 plants native to the area that can be used in a rain garden. Appendix A provides an extensive plant list of hearty native species. There may be other plants with similar names or plants that look similar, but those could be hybrids that need special care or plants that are not perennials in our climate. Consider choosing the plants that are listed in this manual, or talk with professionals at local nurseries or local master gardeners for additional plant possibilities.

We recommend that plants or plugs be used to establish and delineate your rain garden plant layout, as opposed to establishing your rain garden from seeds. If you will be planting established plants (also known as plugs), you will need one plant for every two and a half



square feet. To decide how many plants you will need, divide the square footage of your rain garden by 2.5. For example, if your rain garden will be 75 square feet, you will need to purchase approximately 30 plants.

Before selecting plants for your garden, consider how you might want the garden to look at various times of the year. You may want to select plants that will bloom at different times so that you can have color in the garden from spring to fall. You may want a riot of color or you may want to limit the garden palette to just a few complementary or contrasting colors. Certain plants are known for attracting butterflies, hummingbirds or other wildlife. It may be worth doing some research before buying plants to be sure you are getting plants that will give the garden the look that you want to achieve.

Every plant has its own optimal growing conditions. The following sections can help you select plants and lay out a garden design that will maximize growing conditions to create a vibrant and beautiful mixture of looks for your rain garden.



2.4.1 RAIN GARDEN LAYOUT

The options for rain garden designs are unlimited. As a starting point for your own rain garden design, Appendix B shows possible layouts for your rain garden. If you are an experienced gardener, or as your knowledge grows, you may want to create your own rain garden designs. You can be adventurous with your plant selections while keeping in mind that

different plants have differing needs for sunshine and soil drainage. Do not be afraid to try out ideas until you find the right mix for your individual rain garden. Like most gardens, a rain garden may always be a work in progress.

When selecting plants and choosing a layout for a rain garden it is important to pay close attention to the following factors:

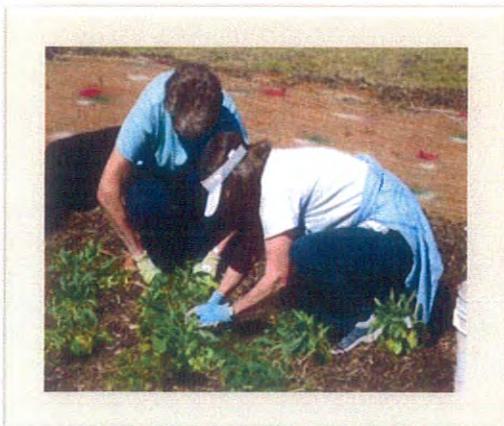
- the amount of sun exposure the rain garden will receive and sun preferences of plants. Most plant books or catalogues will provide sun/shade guides for plants.

- the water tolerance and requirements of the plants. Plants that like saturated or moist soil conditions should be placed in the deepest section of the rain garden (typically the center). Plants that prefer average conditions may be planted around the sides of the rain garden. Plants that prefer dry soil conditions should be located around the top edges or front of the rain garden.

- the blooming period, bloom color and non-bloom color of the plants. Choose a mix of plants that will bloom in spring, summer and fall to provide flowers throughout the growing season. Choose plants with varying colored blooms and distribute colors evenly to create interest. Remember that plant foliage and stems can provide color interest even when the plants are not in bloom.
- the height/size of each plant. Plants that are very tall or wide may cover or shade smaller plants.
- by providing nectar, berries, seeds and shelter, certain plants may attract wildlife such as birds, rabbits, squirrels, deer, butterflies and other insects to the rain garden. When choosing plants, consider what wildlife you want to attract.

2.4.2 PLANT INSTALLATION

Plant materials are available in a variety of forms. Grasses and flowers come in seeds, pots and plugs. Seeds are not recommended for rain gardens because they take several growing seasons to fully establish and they may be washed away in a heavy rain event. Potted plants come in various sizes and are more expensive, but will bloom sooner and give a more established look to the garden. If deep cell plugs are available, they are recommended for use in a rain garden. Plugs are small cone-shaped pots that usually come in packs of six to twelve. Plugs often establish more successfully and are more economical when purchased in bulk.



When you are ready to plant, set out all the plants in the desired location. Check the spacing, and do not be afraid to move things around if necessary. Remember that even though the plants are small right now, they will grow and eventually fill out their space. Do not overcrowd the plants because their root systems will compete and plants that are more aggressive could overtake smaller plants. You should have purchased one plant for every 2.5 square feet of rain garden area.

Each plant should be given the recommended spacing indicated on its tag. If not, a good rule of thumb is to allow one foot of space around smaller plants and four feet of space around larger plants. Make sure to stick the pot tags in the soil next to each plant. Consider planting flowers in groups so that similar plants are located near each other, rather than scattering them around the rain garden individually. This helps when weeding, making it easier to know which plants are weeds and which are “keepers.” When planting, minimize how much you walk through the rain garden in order to avoid compacting the soil. Start at one end of the rain and work your way to the other end. Put down some mulch to walk on if necessary and move the mulch when you are ready to plant there. Keep these tips in mind when planting.

- Keep the plants moist before planting.
- Gently loosen the root ball of the plant before planting.
- Dig a hole twice as wide as the root ball and deep enough so that the root ball is completely covered by soil when the hole is re-filled.
- Loosen the dirt in the hole so the sides and bottom are not compacted. Compacted soil will restrict root growth.
- Gently backfill the hole and compress the soil around the stalk of the plant to minimize air spaces around the roots.



- Water the plants well after planting.

Once the plants are in the ground, mulching keeps them cool and moist, and reduces weeds. Keep in mind that the rain garden will periodically be submerged and that many varieties of wood mulch will float. Use a course, double shredded hardwood mulch to reduce this potential. A few finishing touches will help to create order and beauty and set the rain garden apart from its surroundings:

- Use landscape edging, a wall, fence or row of similar plants to distinguish the rain garden from turf and provide an edge to guide the lawn mower.
- Group common plants to create mounds of color when they bloom.
- Repeat patterns in the rain garden or provide symmetry by matching plantings on both sides of the rain garden.
- Stair-step the plant heights, with the tallest species in the back of the rain garden and the shortest plants toward the front.
- Include structures such as a bench, garden gnome, gazing ball, birdbath or decorative rock.



2.5 MAINTENANCE

2.5.1 WATERING

Plants in the rain garden will be more susceptible to stress when they are young. You will need to water the rain garden plants regularly until the plants are established. This usually takes one or two growing seasons. If you do not get consistent rains, a slow trickle of water from the hose for 30 minutes each week is usually sufficient. After the plants are established, you should not have to water them except during prolonged dry periods.

Large, mature plants can tolerate being saturated better than young, small plants. If your plants become submerged during an extended rainy period, try temporarily routing some of the incoming water away from the rain garden or cutting a notch in the berm on the downstream end of the rain garden so the water does not get so deep. Once the plants are larger and better established, you can re-route the water back into the rain garden or fill in the notch cut.



2.5.2 SPRING

Spring is the best time to plant your rain garden. Once established, spring is also the time to clean up by pruning dead vegetation and plants that have grown too large. You will also need to weed the rain garden and add mulch, if necessary. You should maintain a three-inch mulch layer in the rain garden. During the first one or two growing seasons, you may need to weed more often. As the plants mature and fill in the rain garden you will need to weed less. Remove excess sediment, leaves or debris that may have collected in the rain garden. This is also the best time for planting new or different plants and replacing plants that may have died over the winter. Water wisely as described above and add compost, if desired.



2.5.3 SUMMER

In the summer, the primary maintenance needs will be to remove weeds such as crabgrass and dandelions and to water wisely during dry periods. Be sure to monitor the berm around the edge of the rain garden for erosion. Any damaged areas will need to be repaired by replacing lost soil and adding mulch or reseeding, if the berm is planted with grass.



2.5.4 FALL and WINTER

Autumn presents another opportunity to replace dead plants, remove weeds and water as needed. Do not remove leaves that may have fallen in the rain garden. The leaves will provide compost material for the following spring growth.



The stems and seed heads may be left in the rain garden for winter interest, wildlife cover and bird food. No maintenance is needed during the winter months. You may cut back your rain garden to clean up for spring if desired.

2.6 FREQUENTLY ASK QUESTIONS

Is a rain garden a pond?

Rain gardens are not ponds. If properly designed, a rain garden should only hold water for about 24 hours.

Will a rain garden be a breeding ground for mosquitoes?

No! Properly designed rain gardens are, in fact, mosquito death traps! Mosquitoes lay eggs in standing water. The eggs hatch into larva and then grow to become flying insects. This life cycle needs to take place in standing water and lasts seven to 12 days. So, if a mosquito lays its eggs in a rain garden with standing water and the water infiltrates within a couple of days or less, the eggs will not have an opportunity to develop and will die.



Are rain gardens hard to maintain?

The benefit of using native plants in a rain garden is that they are well adapted to their natural surroundings and do not require significant maintenance, fertilizers or pesticides. The bulk of rain garden maintenance involves periodic watering and weeding.

Will I need to water my rain garden?

You will need to water the rain garden during the first one or two growing seasons until the plants become established. About an inch of water a week is a good rule of thumb. In subsequent years, watering should only be necessary during prolonged dry periods.

How much does it cost to build a rain garden?

Rain gardens do not have to be expensive. If you build the rain garden yourself, the major cost elements are typically plants, soil amendments and mulch. Choosing smaller plants like plugs and buying plants, soil and mulch in bulk will reduce these costs. In 2009 dollars, the average rain garden costs about \$2 to \$5 per square foot if you do the work yourself. If you hire a landscape consultant to design, construct, select and install plants, the cost could increase to about \$10 to \$20 per square foot.



Will a rain garden cause water to seep into my basement?

Wet basements are commonly caused by improper grading and drainage around a house foundation. For example, a downspout may empty right onto the ground next to the house or the surface of the yard may slope toward the house. A rain garden can be used to direct water away from a house foundation by routing downspouts toward the rain garden instead of near the house foundation.

Rain gardens filter pollutants. Will pollutants build up in my rain garden and kill my plants?

Many of the common pollutants that enter rain gardens such as fertilizers, pesticides, oils and sediments are filtered through the mulch and soil in the rain garden. The pollutants do not have a chance to build up in the rain garden because they are constantly being broken down (biodegraded) by microorganisms in the soil. Rarely do the pollutants have an opportunity to affect the plants in the rain garden. Some plants actually absorb pollutants and use them as food.





APPENDIX A

RAIN GARDEN PLANT LIST

FLOWERS	Name	Sunlight	Water Tolerance	Color	Height	Arrange the Plants	Bloom Time
	Black-Eyed Susan <i>Rudbeckia hirta</i>				12"-30"	1.5 ft apart	June-September
	Blue Vervain <i>Verbena bastata</i>				24"-72"	2 ft apart	July-September
	Brown Eyed-Susan <i>Rudbeckia triloba</i>				12"-30"	1.5 ft apart	June-September
	Cardinal Flower <i>Lobelia cardinalis</i>				24"-54"	1 ft apart	July-September
	Common Boneset <i>Eupatorium perfoliatum</i>				24"-60"	2 ft apart	July-September
	Culver's Root <i>Veronicastrum virginicum</i>				36"-60"	1.5 ft apart	June-August
	Cup Plant <i>Silphium perfoliatum</i>				4'-8'	2 ft apart	July-September
	Flat-Top White Aster <i>Aster umbellatus</i>				12"-48"	1 ft apart	July-September
	Foxglove Beardtongue <i>Penstemon digitalis</i>				24"-48"	1.5 ft apart	April-June
	Golden Alexander <i>Zizia aurea</i>				12"-36"	1.5 ft apart	May-June
	Great Blue Lobelia <i>Lobelia siphilitica</i>				12"-30"	1 ft apart	August-September
	Ironweed <i>Vernonia gigantea</i>				36"-48"	2 ft apart	July-August
	Joe Pye Weed <i>Eupatorium maculatum</i>				48"-80"	2 ft apart	July-September
	Marsh Blazingstar <i>Liatris spicata</i>				24"-48"	1 ft apart	July-August
	Marsh Milkweed <i>Asclepias incarnata</i>				36"-60"	2 ft apart	July-September
	Monkey Flower <i>Mimulus ringens</i>				12"-36"	1 ft apart	June-September
	Mountain Mint <i>Pycnanthemum virginianum</i>				24"-36"	1 ft apart	July-September
	New England Aster <i>Aster novae-angliae</i>				24"-48"	2 ft apart	August-September
	Nodding Onion <i>Allium cernuum</i>				12"-18"	6 in apart	June-August
Ohio Spiderwort <i>Tradescantia obtensis</i>				24"-36"	1 ft apart	May-July	
Ox-eye Sunflower <i>Heltopsis helianthoides</i>				24"-48"	2 ft apart	June-September	
Pale Purple Coneflower <i>Echinacea pallida</i>				24"-36"	1 ft apart	June-July	
Purple Coneflower <i>Echinacea purpurea</i>				30"-40"	1.5 ft apart	June-August	

Full Sun
 Part Shade
 Low
 Moderate
 Moderate/High
 High

	Name	Sunlight	Water Tolerance	Color	Height	Arrange the Plants	Bloom Time
FLOWERS	Purple-Stem Angelica <i>Angelica atropurpurea</i>				3'-10'	2 ft apart	June-September
	Queen of the Prairie <i>Filipendula rubra</i>				18"-36"	2 ft apart	July-Frost
	Rattlesnake Master <i>Eryngium yuccifolium</i>				48"-60"	1 ft apart	May-Frost
	Riddell's Goldenrod <i>Solidago riddellii</i>				24"-36"	1.5 ft apart	September-October
	Rose Turtlehead <i>Cbelone obliqua</i>				30"-48"	1 ft apart	July-Frost
	Showy Black-Eyed Susan <i>Rudbeckia fulgida</i>				24"-36"	2 ft apart	June-October
	Smooth Blue Aster <i>Aster laevis</i>				24"-48"	1 ft apart	September-October
	Sneezeweed <i>Helenium autumnale</i>				36"-60"	1.5 ft apart	August-October
	Southern Blue Flag Iris <i>Iris virginica</i>				12"-42"	1.5 ft apart	May-June
	Stiff Goldenrod <i>Solidago rigida</i>				36"-60"	2 ft apart	August-September
	Swamp Rose Mallow <i>Hibiscus palustris</i>				36"-60"	2 ft apart	August-September
	Tall Tickseed <i>Coreopsis tripteris</i>				2'-8'	2 ft apart	July-September
	Wild Bergamont <i>Monarda fistulosa</i>				24"-48"	1 ft apart	July-Frost
	Wild Senna <i>Senna hebecarpa</i>				36"-72"	2 ft apart	July-August
	Yellow Coneflower <i>Ratibida pinnata</i>				36"-72"	1.5 ft apart	June-August
GRASSES / SEDGES	Asa Gray's Sedge <i>Carex grayi</i>				12"-36"	1.5 ft apart	May-July
	Big Bluestem <i>Andropogon gerardii</i>				5'-9'	2 ft apart	July-August
	Blue Joint Grass <i>Calamagrostis canadensis</i>				24"-36"	2 ft apart	May-July
	Canada Wild Rye <i>Elymus canadensis</i>				24"-60"	2 ft apart	July-September
	Crested Sedge <i>Carex cristatella</i>				36"	1 ft apart	May-July
	Dark Green Bulrush <i>Scirpus atrovirens</i>				24"-48"	2 ft apart	May-July
	Drooping Bulrush <i>Scirpus pendulus</i>				12"-48"	2 ft apart	May-July
	Fox Sedge <i>Carex vulpinodea</i>				12"-36"	1.5 ft apart	May-July

Full Sun
 Part Shade
 Low
 Moderate
 Moderate/High
 High



GRASSES / SEDGES	Name	Sunlight	Water Tolerance	Color	Height	Arrange the Plants	Bloom Time
	Frank's Sedge <i>Carex frankii</i>				12"-36"	1.5 ft apart	May-July
	Giant Burreed <i>Sparganium eurycarpum</i>				12"-48"	2 ft apart	May-July
	Hairy Fruited Lake Sedge <i>Carex trichocarpa</i>				12"-36"	1.5 ft apart	May-July
	Indian Grass <i>Sorghastrum nutans</i>				4'-7'	1.5 ft apart	September-February
	Lakebank Sedge <i>Carex lacustris</i>				12"-36"	1.5 ft apart	May-July
	Little Bluestem <i>Schizachyrium scoparium</i>				24"-36"	8 in apart	May-March
	Meadow Sedge <i>Carex granularis</i>				12"-36"	1.5 ft apart	May-July
	Porcupine Sedge <i>Carex hystericina</i>				12"-36"	1.5 ft apart	May-July
	Prairie Cord Grass <i>Spartina pectinata</i>				4'-10'	2 ft apart	May-July
	Prairie Dropseed <i>Sporobolus heterolepis</i>				18"-24"	2 ft apart	August-October
	Short's Sedge <i>Carex sbortiana</i>				12"-36"	1.5 ft apart	May-July
	Soft Rush <i>Juncus effusus</i>				12"-24"	1.5 ft apart	May-September
	Softstem Bulrush <i>Scirpus validus</i>				2'-8'	2 ft apart	May-July
	Stalk Grain Sedge <i>Carex stipata</i>				12"-36"	1.5 ft apart	May-July
	Switch Grass <i>Panicum virgatum</i>				36"-72"	2 ft apart	July-February
	Tussock Sedge <i>Carex stricta</i>				12"-36"	1.5 ft apart	May-July
Woolgrass <i>Scirpus cyperinus</i>				48"-60"	2 ft apart	May-July	

Full Sun
 Part Shade
 Low
 Moderate
 Moderate/High
 High

APPENDIX B



FIGURE 6: OBLONG RAIN GARDEN DESIGN

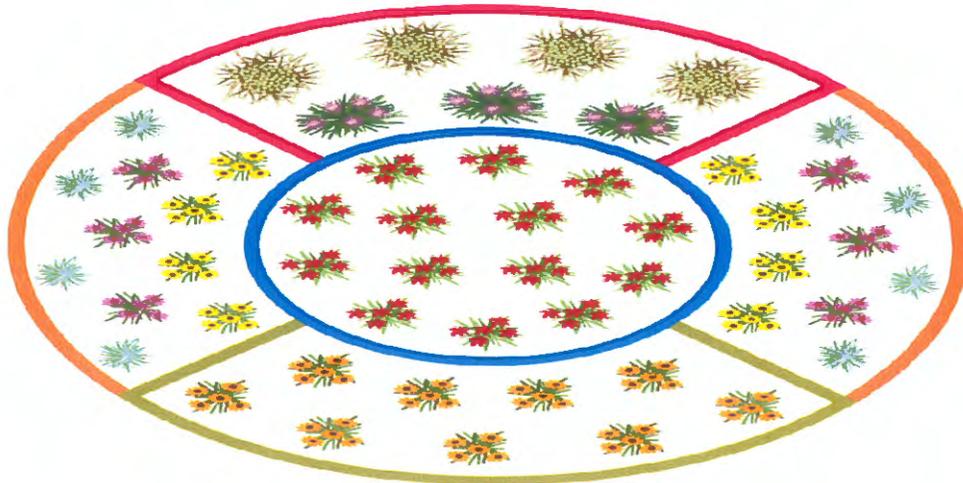


FIGURE 7: CIRCULAR RAIN GARDEN DESIGN

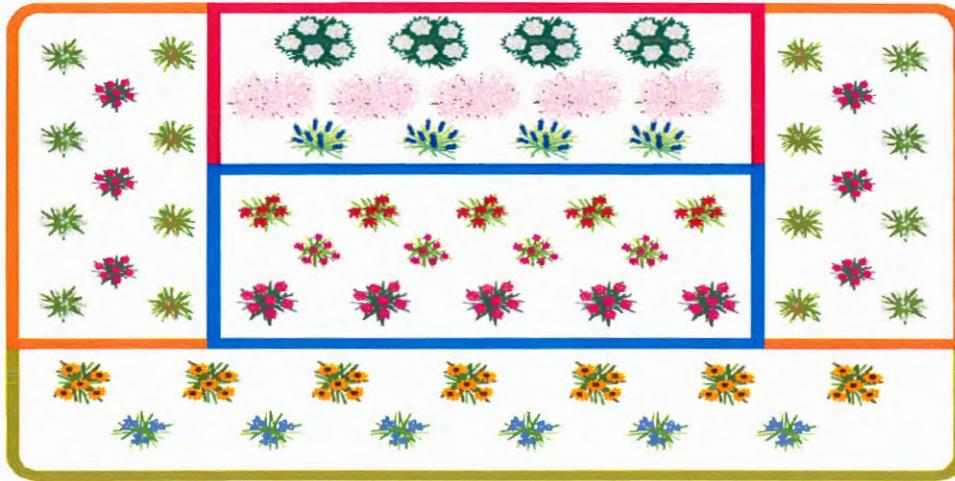


FIGURE 8: RECTANGULAR RAIN GARDEN DESIGN

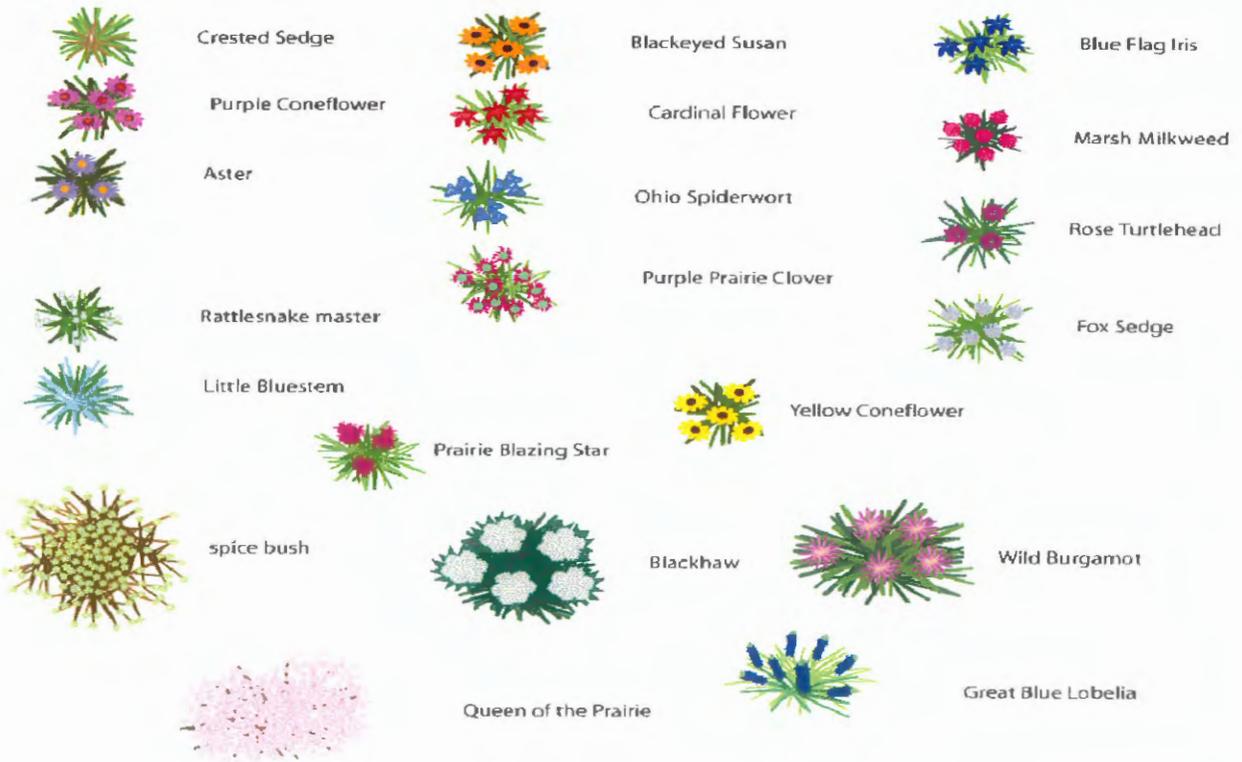


FIGURE 9: KEY FOR RAIN GARDEN DESIGN EXAMPLES