# Rain garden manual for New Jersey

**The Native Plant Society of New Jersey**
Office of Continuing Professional Education
Cook College 102 Ryders Lane New Brunswick, NJ 08901-8519
***www.npsnj.org***

## Native Plants of New Jersey

*Amsonia tabernaemontana*
**Blue Star**

*Anemone canadensis*
**Canadian Anemone**

*Arisaema triphyllum*
**Jack-in-the-pulpit**

*Asclepias incarnata*
**Swamp Milkweed**

*Asclepias syriaca*
**Common Milkweed**

*Aster (Eurybia) divaricatus*
***White Wood Aster***

*Aster (Symphyotrichum) novae-angliae*
**New England Aster**

*Chelone glabra*
**White Turtlehead**

*Eupatorium perfoliatum*
**Boneset**

*Eupatorium sp.*
**Joe-pye-weed**

*Geranium maculatum*
**Wild Geranium**

*Lilium superbum*
**Turk's Cap Lily**

*Lobelia cardinalis*
**Cardinal Flower**

*Lobelia siphilitica*
**Great Blue Lobelia**

*Mertensia viriginica*
**Virginia Bluebells**

# The Native Plant Society of New Jersey

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# FOREWARD

Congratulations!

You are about to embark on a journey that can improve the future of your state!

The Native Plant Society of New Jersey is proud to present this manual on rain gardens. Although we did not invent rain gardens, we have surely adopted them as a perfect way to protect and restore our natural resources. The rain garden has become the NPS's "poster child", in that, while promoting native plants, rain gardens intercept runoff and infiltrate storm water to recharge our depleted aquifer. Every drop of water kept out of our storm drains reduces flooding, purifies water, and improves base flow of streams and rivers. The NPS staff has worked on this important project for over one year.

The NPS has adopted rain garden publications from other states, finally adapting it for New Jersey. In a rain garden is hope for much of what plagues New Jersey-sprawl, excessive flooding, depletion of groundwater, and loss of habitat. And it is educational and fun to build. Kids love them.

If I can impart one message with you, the user of this Manual, it is that rain gardens are easy. It is a project where perfection is <u>not</u> required. Like NIKE says: "Just do it". If you only have enough space to collect twenty percent of the runoff, it is still well worth it—don't pass on this wonderful opportunity to teach, learn, and grow together.

This manual is intended to walk you through any fears or reservations you might have, give you encouragement, tools, and all the answers you need to make and sustain a rain garden-one of the best and easiest things you can do to protect and conserve NJ natural resources.

So, grab a shovel, get some plants and get out there and do it.

And, most of all, have fun.

Yours in native plants,

William E. Young
Native Plant Society of New Jersey

# PREFACE

The Native Plant Society of New Jersey (NPSNJ) is proud to share The Rain Garden Manual (the Manual) with you. Though much of the Manual is designed to help homeowners build their own rain garden, its impetus comes from the growing demand of educators throughout New Jersey for help in creating rain gardens on their campuses with and for their students. It is with these students and teachers in mind that we have developed the Rain Garden Manual you now hold in your hands. Although the Manual can be adapted for use at homes and schools in most of the United States, it has been written specifically for application in New Jersey with the state's unique and varied native plants, soils and climate in mind. Whether you are a private homeowner, a park naturalist or a school teacher, it is our hope that you will use the instructions in the Rain Garden Manual to create a rain garden of your own. Even a small rain garden can look good while doing good work!

Armed with the information in this Manual, you can enhance the natural functions of your home or school. With a little planning, your rain garden can become a native plant oasis that provides habitat for birds, butterflies and other wildlife. While having fun and beautifying the landscape, you will also be benefiting water quality by filtering stormwater runoff and facilitating groundwater recharge. Plus, a rain garden serves as an outdoor classroom offering new, engaging and multi-disciplinary teaching opportunities that contribute to healthier watersheds. In fact, building a rain garden with your students is perhaps the single best thing you can do to improve the environment in New Jersey!

The goal of the Manual is to outline a step-by-step guide to build a rain garden both easily and economically. However, it is important to realize that this is merely a guide; your own creativity will allow you to tailor the process to your own needs and will make for a more enjoyable experience. We hope that this Manual will be your first step in the designing and building your own rain garden.

NPSNJ would like to thank The Watershed Institute, a program of the Stony Brook Millstone Watershed Association, for a generous grant which provided for the development and distribution of this manual. Visit their website at:

**http://www.thewatershedinstitute.org**

We would also like to cite two primary sources, used with permission, which were invaluable in the creation of a New Jersey-focused manual:

**"Rain Gardens, A how-to manual for homeowners"**
Developed by Roger Bannerman, Wisconsin Department of Natural Resources and Ellen Considine, U.S. Geological Survey. Special thanks to John Gishnock, Applied Ecological Services, Inc., Jennifer Baker, Prairie Nursery Inc. and Joyce Powers, CRM Ecosystems Inc.
http://clean-water.uwex.edu/pubs/raingarden

**LID Sustainable School Projects Website**
Low Impact Development Center
5010 Sunnyside Avenue, Suite 200
Beltsville, Maryland 20705
Their work was developed through a Cooperative Assistance Agreement under the US EPA Office of Water 104b(3) Program in order to provide guidance to administrators, teachers, students, and parents for developing, administering, and incorporating Low Impact Development (LID) into their school community.
http://www.lowimpactdevelopment.org/school

# FAQs

## Q: Why are rain gardens important?

**A:** Two of the most important environmental issues are *water quality* and *stormwater control*. Rain Gardens enhance local water quality by allowing water to be naturally filtered by soil instead of being piped, untreated into large bodies of water. A simple, yet effective method to enhance water quality and control stormwater is through the use of rain gardens.

Beyond its environmental use, rain gardens provide attractive landscaping and a natural habitat for birds and butterflies, while encouraging environmental stewardship and community pride. In addition, using native plant species in your rain garden will be an excellent way to increase native populations in a developed area.

## Q: How is a "rain garden" different from any other garden?

**A:** To a certain extent, a regular flower garden, or even a vegetable garden, functions like a rain garden. But, for a garden to be a *rain* garden – i.e. to capture and infiltrate precipitation into the groundwater – it must be dug down or planted slightly below-grade to catch the runoff in a shallow basin.

Ideally, a rain garden is also planted with a variety of native grasses, forbs and other herbaceous or woody plants that are adapted to the soil, precipitation, climate and other site conditions. These native plants have deeper root systems that facilitate the efficient recharge of our aquifers and also sustain the plants through the draughts that sometimes occur in our NJ summers.

## Q: How do you build a rain garden?

**A:** The design of a rain garden involves, among other things, the hydrologic cycle, non-point pollutant treatment, resource conservation, habitat creation, nutrient cycles, soil chemistry, horticulture, landscape architecture, and ecology.

Sound complicated? Don't worry, it isn't! In this manual we will provide you with simple step-by-step instructions that will allow you to enjoy helping the environment and enhancing your landscape.

# 1

# STEP ONE: The Planning

## Goals & Strategies

It is good to set goals and objectives to help guide you through the process. Goals are useful to let you know if you succeeded. "Capturing 50% of site runoff in my rain garden" is an excellent goal one might choose. An objective could be: "using only native plants in the rain garden", "reducing watering in my garden", "capturing water in rain barrels from my gutters". The obvious goal of your project is to design and build a rain garden. However, this experience can be much more rewarding both personally and environmentally if you include other individuals and groups in your project. Not only will you forge and strengthen bonds with those in your community, you will provide the knowledge and experience necessary to create a rain garden of their own and further strengthen the local natural community.

## Budget

Residential rain gardens average about $3 to $4 per square foot, depending on soil conditions and the desired species, size and density of plants used. Commercial, industrial and institutional site costs can range between $10 and $40 per square foot if there is a need for other control structures including: curbing, storm drains and under-drains. Generally, the cost of the plants will be the majority of the total cost of the project. A list of plants and concept sketches are provided in the back of this manual. Call your local nursery to determine costs of plants.

## Preliminary Steps

Here are some preliminary steps to complete before designing:

- Research site specific information such as the location of utilities, wetlands, fire lanes, future building plans, etc.

- Be sure you have proper approval from school administration and maintenance staff

- Survey the grounds to identify possible rain gardens sites including areas with downspouts, gutters, soil erosion or locations where water ponds and puddles form during/after storms

● Do you need a permit? Not typically, but if you are in doubt, it is best to ask your county and township offices.

● Pay attention to drainage problem areas; it may help to take pictures.

● Conduct an informal survey of your community (including students, staff, parents, and maintenance staff) to determine their satisfaction with the current state of the local environment

● Create an informal contract with the students and staff. Designate responsibility to upkeep the garden from year to year. Perhaps use an honor system or honor contract.

## Call Before You Dig

Common utilities will include: water, sewer, electricity, natural gas, telephone, cable, and possibly a separate storm sewer (some older areas have combined sewers, where the stormwater drains directly into the sanitary sewer system). It is often difficult and time consuming to find out exactly where all of the utilities are buried on your site, so start early. Write letters to each of the utility companies, requesting plans showing the locations of underground utilities on your property. Try to avoid using areas where the utilities enter the building. Before construction, you can **call NJ One Call at 1-800-272-1000***. A representative will come to your site and mark the locations of utilities with spray paint, so you can be certain of avoiding them. Stay at least five feet horizontally and one foot vertically from any utilities.

**Locate Your Utility Lines**

Call BEFORE You Build!

NJ One Call
1-800-272-1000*

***** The State of New Jersey requires that the location of underground installations (e.g., sewer, telephone, electrical, fuel, natural gas, water and other lines, and underground tanks) must be identified and marked out prior to work that involved any digging operation. Activities covered by this requirement include, but are not limited to, excavations or trenching, blasting, installation of tents, sign posts, or fence posts, removing or planting of trees, or the planting of a new garden. New Jersey One-Call must be contacted at 1-800-272-1000 at least three (3) full working days, but not more than ten (10) days, prior to the planned start date of the digging operations. In the event of an emergency (e.g., broken water line, etc.) that will require an excavation, the One-Call system operator must still be contacted. The One-Call system operator has an emergency response procedure that includes the immediate dispatch of mark-out technicians.

## Check Your Soil

This is an excellent time to call your local Rutgers Cooperative Extension****** (see next page) to have them test the soil. They will do this for a small fee (around $10). Since a lot of earth was moved during the school's construction it is likely that your soils will be highly compacted and will not drain well. In order to compensate for this, you may need to use a special soil mix within the rain garden. A good soil mix for a rain garden is 50% sand, 20% topsoil, and 30% compost. If the soil onsite contains less than 10% clay, then it can be used in place of imported topsoil in the mix. You may be able to use the existing soil, but if it is not in good condition, you may have to spend some money on new soil and/or amendments such as lime, gypsum and specific nutrients.

## Consider This

Before building the rain garden, think about *how* it will catch water. Runoff will flow out of a downspout and should spread evenly across the entire length of the rain garden. The rain garden must be as level as possible so water doesn't pool at one end and spill over before it has a chance to infiltrate.

Also consider what will happen to any rain garden runoff during *very large* storms. The rain garden is designed for small storms. When there is a great deal of rain, the rain garden will fill and eventually overflow. Where will the water go when it overflows the rain garden? Minimize the impact that this overflow will have by directing it toward grassy areas, wooded areas or existing storm drains.

**TIP**
Avoid putting a rain garden next to trees. Soils near trees tend to have the best drainage, and should not be disturbed.

**TIP:**
Avoid putting a rain garden near heavy foot traffic areas.

Heavy foot traffic will pack down the soil in the rain garden, which will degrade its ability to infiltrate runoff.

****** Contact information for your local Rutgers Cooperative Extension by county can be found at the following website: http:// www.rce.rutgers.edu/county

**Rutgers Cooperative Extension**
Cook College
Rutgers, The State University of New Jersey
88 Lipman Dr.
New Brunswick, NJ 08901-8525
**Phone: 732-932-9306**

# 2
# STEP TWO:
# The Design

There are two primary factors to consider when designing a rain garden: The *location* of your rain garden and the *surface area* of your rain garden

## HOW TO: Find an appropriate <u>location</u> for a Rain Garden

Walk around the area *during* the next rain, noting where puddles form, where areas are not draining well and where runoff is flowing.

The rain garden should be located in a place where it will receive runoff. You want to make sure runoff flows toward your rain garden site, or could flow with minor modifications.

Do not plan a rain garden too close to the foundation. A good location is at least 30 feet or more from your building foundation if you have a basement. If you do not have a basement the garden can be as close as 10 feet from your building.

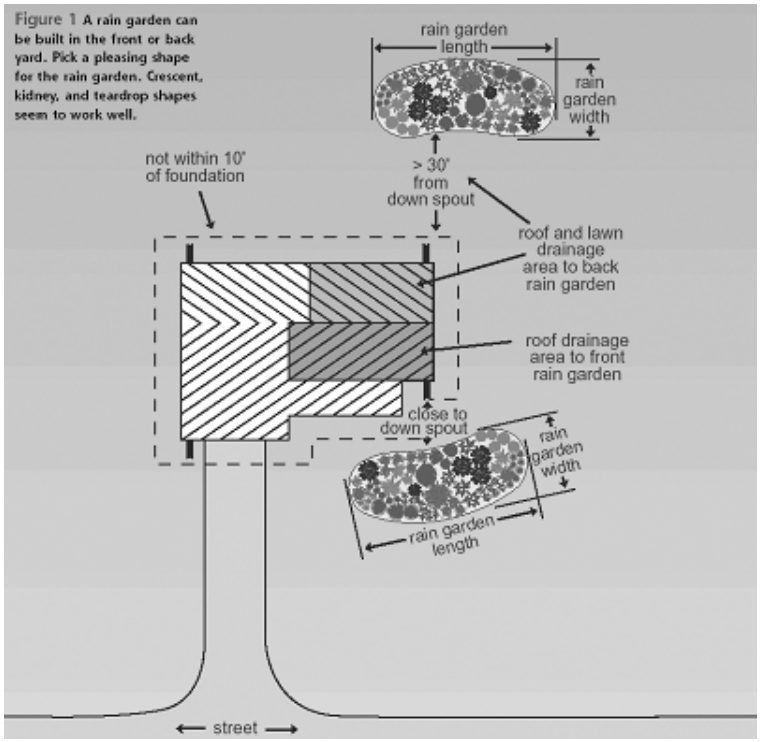


Figure 1 A rain garden can be built in the front or back yard. Pick a pleasing shape for the rain garden. Crescent, kidney, and teardrop shapes seem to work well.

## HOW TO: Determine the <u>Surface Area</u> of a Rain Garden

The surface area of the rain garden can be almost any size and shape, but time and cost will always be important considerations in making your decisions. Although any size rain garden will provide *some* stormwater runoff control, a typical residential rain garden ranges from 100 to 300 square feet. Rain gardens can be smaller than 100 square feet, but very small gardens have little plant variety. If a rain garden is larger than 300 square feet it takes a lot more time to dig, it is more difficult to make level, and could be hard on your budget.

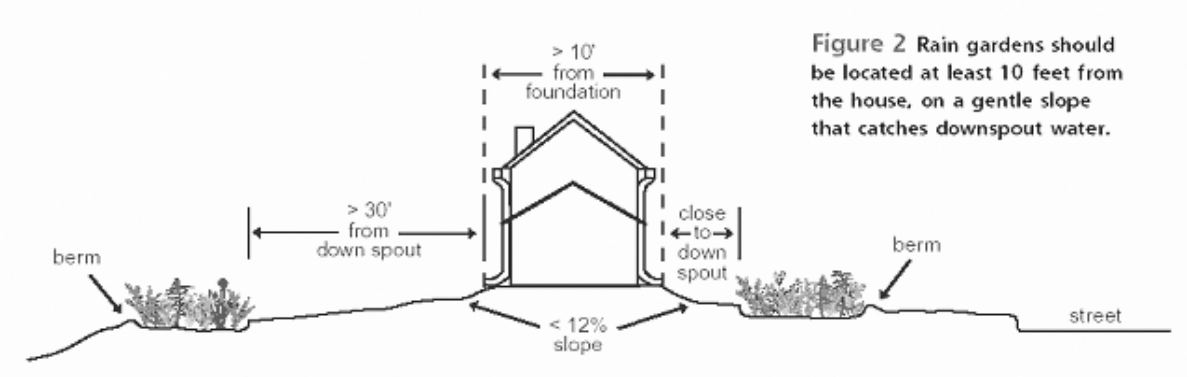



Figure 2 Rain gardens should be located at least 10 feet from the house, on a gentle slope that catches downspout water.

The Surface Area of your Rain Garden will depend on:

- The DEPTH of the rain garden
- What TYPE OF SOILS are used in the rain garden
- How much will DRAINAGE will go to the garden

This information, along with the sizing factor from the tables on page 16, will determine the surface area of the rain garden. First, we will figure out how the depth of your rain garden.

**A good rule of thumb:**

The rain garden should be about twice as long (perpendicular to the slope) as it is wide.

## HOW TO: Determine the Depth of a Rain Garden

The depth is how far you need to dig to make the base of your rain garden level. A typical rain garden is between four and eight inches deep. A rain garden more than eight inches deep might pond water too long. It may also look like a hole in the ground and present a tripping hazard for somebody. A rain garden much less than four inches deep will need an excessive amount of surface area to provide enough water storage to infiltrate the larger storms. The slope of the lawn should determine the depth of the rain garden.

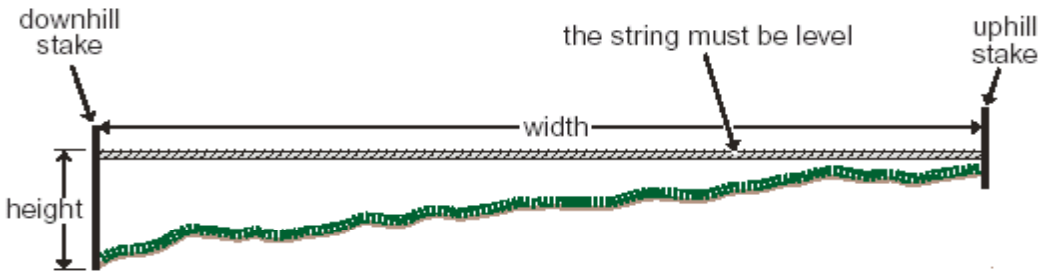



Figure 3 The string should be tied to the base of the uphill stake, then tied to the downhill stake at the same level.

## HOW TO: Find the slope of your lawn

1. Pound one stake in the ground at the uphill end of your rain garden site and pound another stake in the ground at the downhill end (figure 3). The stakes should be about 15 feet apart.
2. Tie a string to the bottom of the uphill stake and run the string to the downhill stake.
3. Using a string level or the carpenter's level, make the string level and tie to downhill stake.
4. Measure the width (in inches) between the two stakes.
5. Now measure the height (in inches) on the downhill stake between the ground and string.
6. Divide the height by the width and multiply the result by 100 to find the lawn's percent slope. If the slope is more than 12%, it's best to find another site or talk to a professional landscaper.

**Using the slope of the lawn, select the depth of the rain garden from the following options:**

- If the slope is less than 4%, it is easiest to build a 3 to 5-in. deep rain garden.
- If the slope is between 5 and 7%, it is easiest to build a 6 to 7 in. deep rain garden.
- If the slope is between 8 and 12%, it is easiest to build an 8 in. deep rain garden.

***EXAMPLE:***
Todd measures the length of the string between the stakes; it is 180 inches long.
The height is 9 inches. He divides the height by the width to find his lawn's percent slope.

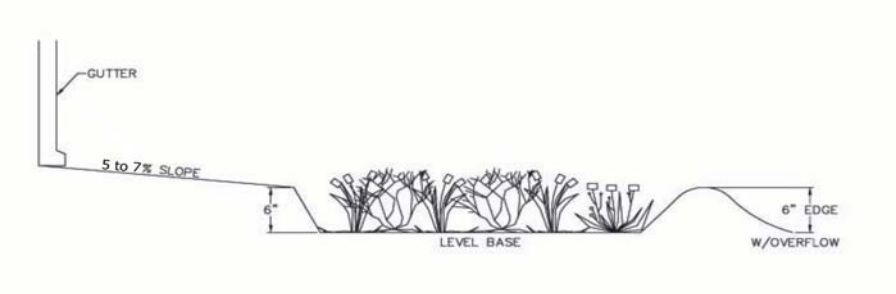
$$\frac{\text{Height}}{\text{Width}} \times 100 = \% \text{ Slope} \qquad \frac{9 \text{ inches}}{180 \text{ inches}} \times 100 = 5 \% \text{ Slope}$$

With a 5% slope, Todd should build a 6-inch deep Rain Garden.

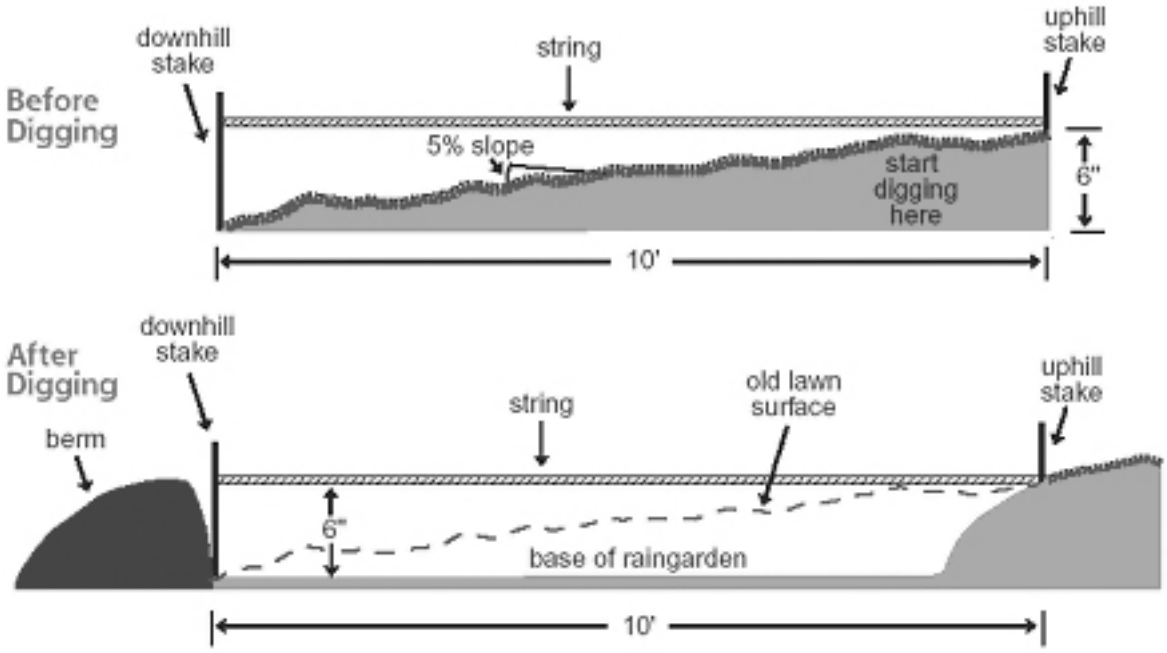
## HOW TO: Keep Your Rain Garden Level.

No matter what the depth of the rain garden, the goal is to keep the garden level. Digging a very shallow rain garden on a steep lawn will require bringing in extra topsoil in order to bring the down-slope part of the garden up to the same height as the up-slope part of the garden. As the slope gets steeper, it is easier to dig the rain garden a little deeper to make it level.

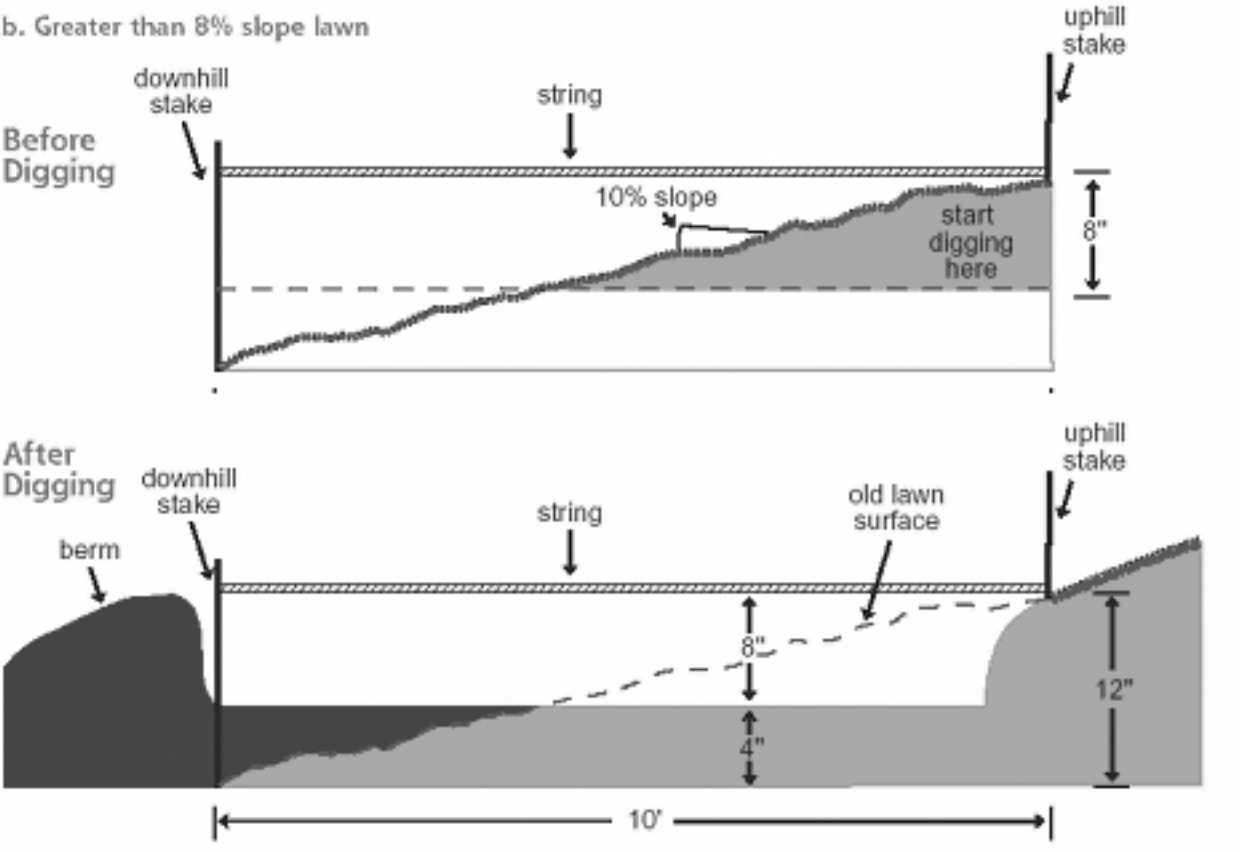
**Figure 4. Plants at base of a 6-inch deep Rain Garden**



a. Between 3% and 8% slope lawn




b. Greater than 8% slope lawn



Now that you know how deep your rain garden should be, you need to determine the rain garden's surface area. This requires investigation in your type of soil and how big the area draining to the rain garden is.

## HOW TO: Determine What Types of Soils Are on the Rain Garden Site?

After you choose the rain garden depth, you need to identify the lawn's soil type as sandy, silty, or clayey. Sandy soils have the fastest infiltration; clayey soils have the slowest. Since clayey soils take longer to absorb water, rain gardens in clayey soil must be bigger than rain gardens in sandy or silty soil. If the soil feels very gritty and coarse, you probably have sandy soil. If your soil is smooth but not sticky, you have silty soil. If it is very sticky and clumpy, you probably have clayey soil. If you bring in your soil for the county extension agent to analyze, ask them the soil type. (See page 10 for contact info.)

## HOW TO: Measure the Area Draining to the Rain Garden?

The next step in choosing your rain garden surface area is to find the area that will drain to the rain garden. As the size of the drainage area increases so should the surface area of the rain garden. There is some guesswork in determining the size of a drainage area, especially if a large part of the lawn is up-slope from the proposed garden site. Use the suggestions below to estimate the drainage area without spending a lot of time.

### If your rain garden is LESS than 30 feet from the downspout

In this case, where the rain garden is close to the school or house, almost all water will come from the roof downspout. Walk around the building and estimate what percent of the roof feeds to that downspout. Many houses have four downspouts, each taking about 25% of the roof's runoff.

Next find your building's footprint, the area of the first floor. If you don't already know it, use a tape measure to find its length and width. Multiply the two together to find the approximate area of your roof.

Finally, multiply the roof area by the percent of the roof that feeds to the rain garden downspout. This is the roof drainage area. If your rain garden will be draining the large, flat roof of a school or if the downspouts are buried and run to the street or parking lot, you may want to get input from a professional landscaper.

### If your rain garden is MORE than 30 feet from the downspout

If there is a significant area of lawn uphill that will also drain to the rain garden, add this lawn area to the roof drainage area. First find the roof drainage area using the steps (above) for a Rain Garden less than 30' from the downspout.

Next find the area of the lawn that will drain to the rain garden. Stand where your rain garden will be and look up toward the house. Identify the part of the lawn sloping into the rain garden.

Measure the length and width of the uphill lawn, and multiply them to find the lawn area.

Add the lawn area to the roof drainage area to find the total drainage area.

***EXAMPLE:***

Todd's house is 60 feet by 40 feet, so the roof area is 2400 square feet. He estimates that the downspout collects water from 25% of the roof, so he multiplies 2400 by 0.25 to get a downspout drainage area of 600 square feet.

**Roof Area:** 60 ft by 40 ft = 2400 square ft.
**Drainage Area:** 2400 square ft. x 0.25 = 600 square ft.

## HOW TO: Use the Rain Garden Sizing Factors

Having estimated the drainage area, soil type, and depth for your rain garden, use Table 1 or Table 2 to determine the rain garden's surface area. Use Table 1 if the rain garden is less than 30 feet from the downspout, and use Table 2 if it is more than 30 feet from the downspout.

**TABLE 1: If Your Rain Garden is LESS than 30ft from downspout**

| TYPE OF SOIL | 3-5in. DEEP | 6-7in. DEEP | 8in. DEEP |
|---|---|---|---|
| Sandy Soil | 0.19 | 0.15 | 0.08 |
| Silty Soil | 0.34 | 0.25 | 0.16 |
| Clayey Soil | 0.43 | 0.32 | 0.20 |

**TABLE 2: If Your Rain Garden is MORE than 30ft from downspout**

| TYPE OF SOIL | Size Factor for ALL Depths |
|---|---|
| Sandy Soil | 0.03 |
| Silty Soil | 0.06 |
| Clayey Soil | 0.10 |

1. Find the size factor on Table 1 or 2 for your soil type and rain garden depth.
2. Multiply the size factor by the drainage area. This number is the recommended rain garden surface area.
3. If the recommended rain garden surface area is much more than 300 square feet, you can divide it into smaller rain gardens for easier management.

***EXAMPLE:***

Todd's rain garden is less than 30 feet from the downspout, and his lawn has a 5% slope, so he will have a 6-inch deep rain garden. His lawn is silty, so Table 1 recommends a size factor of 0.25. He multiplies the downspout drainage area, 600 square feet, by 0.25 to find the recommended rain garden area, 150 square feet.

600 square ft. by 0.25 = 150 square ft.

## HOW TO: Select Plants for Your Rain Garden

The success of your rain garden depends on selecting the right types of plants. Observe your rain garden site and record pertinent information such as hours of sun, reflections off adjacent buildings and excessive wind. These conditions may contribute to unusual 'microclimates' due to increased heat or exposure and it is necessary to choose plants accordingly.

Plant your rain garden with plants that will thrive in that environment. Whether in the sun or shade, rain gardens can be planted with shrubs and flowers that are beautiful and low maintenance – as long as you select the plants that love those conditions. Native plants – or plants that are indigenous to this climate or region -- can thrive without a lot of care, extra water, or extra fertilizer.

**TIP:**
Remember that many plants provide berries for birds or have interesting architecture especially when accentuated by snow and ice.

There is a wide variety of plants available for each condition such as: full sun (6 or more hours), part sun (4-6 hours) or shade (less than 4 hours), or that can withstand 'wet feet' or are drought tolerant. For esthetic purposes select plants that have various heights, leaf color and shape, and that bloom in a wide array of colors throughout the seasons.

## Consider these factors when selecting your plants:

- Native plants provide better habitat and require less watering
- Non-native invasive plants overtake gardens and may escape into surrounding areas
- Some toxic/poisonous plants cause harm to pets and children

# 3

# STEP THREE:
# Build Your Rain Garden!

## Preliminary Plans for Construction Day

1. Ask volunteers to bring gloves, labeled tools/shovels, sunscreen, snacks and water bottles.
2. Create a Task List and be sure to delegate responsibilities!
3. Have copies of rain garden layout on hand to communicate goals.
4. Be sure to have a first aid kit readily available. Think safety!
5. Make sure you have access to a water hose!
6. Contact local newspaper, or designate a student volunteer or parent to take photos and write about the event
7. Encourage picture taking before, during and after rain garden construction.
8. Have fun!

## Day 1- Rain Garden Construction

It is a good idea to take precautions to minimize loss of soil due to runoff by installing sediment control devices such as straw bales or silt fence on the downward gradient. Grade your rain garden site to elevations shown on plan.

Excavate area to proposed depth taking care not to compact the soil. A contractor may be hired to dig the hole.

## Day 2 – Planting your Rain Garden

Plant your vegetation. Remember to look at the lists and designs provided in the appendices. Designers and horticulturists have prepared these recommendations not only for aesthetics but because these specific plants do well with wet conditions. The different mixes are also specific to varied light and soil regimes.

Mulch. Apply a 2"-3" layer of mulc to the rain garden. This will help plants conserve water during dry spells and prevent plants from frost heaving if installed late in the season.

Plant the downhill berm to stabilize it so it won't wash away. Remove the sediment control devices. Then water well and enjoy.

# 4
# STEP FOUR:
# The Maintenance

After the completion of your rain garden, certain steps need to be followed to ensure continuing success with your creation. Proper maintenance of your garden can be incorporated into lesson plans for teachers.

### After the planting:

- Water daily for 14 days unless there is significant rainfall
- Inspect your new rain garden for signs of erosion
- Re-mulch any areas if necessary
- Use small stones to stabilize the erosion along the drainage paths

**TIP:**
Post a "No-Mow" sign and be sure to consult with maintenance staff so they are mindful of your project.

### The following month:

- Inspect plants to ensure that they are free of pests and diseases
- (use a less toxic approach if treatment is warranted).
- Repair any areas that may appear to be weather-beaten
- Add mulch to areas that lack sufficient coverage
- Remove any weeds that may be growing

### The following seasons:

- Every 6 months, in spring and fall, add 1" of mulch.
- Once every 2 to 3 years, in the spring, apply a 3" layer of mulch.
- If plants show signs of pests or disease, consult a local horticulturist or remove infected plant(s) and replace before infecting other plants.
- Check the rain garden after large rainstorms. Make sure pooling water dissipates within 6 days. Gardens that do not drain properly may need additional soil amendments.
- During times of extended drought, look for physical features of stress (wilting, yellow, spotted or brown leaves, loss of leaves, etc.).
- Water in the early morning as needed.
- Prune excess growth annually or more often, if desired. Trimmed materials may be recycled back in with replenished mulch.
- Weed regularly, if needed, but avoid mowing.
- Spread the word about rain gardens!

**TIP:**
Don't bite off more than you can chew! Make sure your garden is a size you can maintain.

# 5

# STEP FIVE:
# Enjoy Your Rain Garden!

The beauty and endless opportunities to learn from a maturing rain garden are now yours to discover. Watch, learn and feel good about your contribution to a healthier environment.

There are many ways to enjoy your new rain garden. You can:

- Take pictures throughout the seasons to document changes/growth.
- Examine the ecology of the bugs and other animals.
- Collect and press flowers for art projects.
- Provide tours to friends, family and administrators.
- Add interpretative signs for passerbys
- Have a contest to name your rain garden
- Label the different plant species with common and latin names so that others may appreciate the garden.
- Call the local newspaper or TV to show off your hard work – perhaps a public unveiling!
- Decorate your garden with art (sculpture students, etc.)

# Key Information

## What is Non-point Source Pollution?

Related to water resources, non-point source pollution is the introduction of impurities into a surface-water body or an aquifer, usually through a non-direct route and from sources that are "diffuse" in nature. Discharges from non-point sources are usually intermittent, associated with a rainfall or snowmelt event, and occur less frequently and for shorter periods of time than do point source discharges. Non-point sources of pollution are often difficult to identify, isolate and control. "Non-point Source" is commonly abbreviated as "NPS."

Examples of NPS pollution include: automobile emissions, road salt, dirt and grit, and runoff from parking lots; runoff and leachate from agricultural fields, barnyards, feedlots, lawns, home gardens and failing on-site wastewater treatment systems. Most NPS pollutants fall into six major categories: sediment, nutrients, acid and salts, heavy metals, toxic chemicals and pathogens, according to the U.S. Department of Agriculture (USDA), and other state and federal agencies.

## What is NPS vs. Point Source Pollution?

Pollutants affecting water quality may come from point or non-point sources, or a combination of both. Like NPS pollution, point source pollution is the introduction of an impurity into a surface-water body or aquifer. However, the difference is that the point source impurity enters the water resource at an easily identifiable, distinct location though a direct route. Discharges from point sources of pollution often are continuous, and easier to identify and measure compared to NPS discharges. Because of these properties, point sources are somewhat easier to control, although control measures are usually more expensive compared to NPS controls.

Examples of point sources include: construction, agriculture, mining, home & garden, logging, industrial plants, commercial businesses and wastewater treatment plants. Point source pollutants are usually municipal or industrial wastes, but are not limited to these.

## What is Best Management Practices or BMPs?

A major activity of many water quality projects is the implementation of Best Management Practices, usually called BMPs. As related to water resources, BMPs are implemented to improve or protect the quality and/or quantity of the resource. In terms of NPS pollution, a BMP is a cultural or engineering technique, or a management strategy that has been evaluated and accepted to be an effective and practical means of preventing or reducing non-point source pollution in a local area. The evaluation and implementation of a BMP, or combination of BMPs, should focus on the management of inputs, and try to provide a balance between economic and environmental considerations. rain gardens in schoolyard habitats are effective BMPs for managing and retaining building runoff, irrigating a garden site and preventing soil erosion.

## Rain Garden Web Sites

**University of Wisconsin-Extension, Rain Garden Publications**
http://clean-water.uwex.edu/pubs/raingarden

**Rain Gardens A how-to manual for homeowners**
http://clean-water.uwex.edu/pubs/raingarden/rgmanual.pdf

**Rain Gardens A household way to improve water quality in your community**
http://clean-water.uwex.edu/pubs/raingarden/gardens.pdf

**Rain Gardens of West Michigan-Home**
http://www.raingardens.org/index.php

**Montgomery County Maryland, Rainscapes resource page**
http://www.montgomerycountymd.gov/mc/services/dep/rainscapes/garden.htm

**Southeastern Oakland County Resource Recovery Authority Healthy Lawns and Gardens Program**
http://www.socwa.org/lawn_and_garden.htm

**Maplewood Minnesota Rainwater Gardens Site (search site for "rain water garden")**
http://www.ci.maplewood.mn.us

**Wisconsin Natural Resources Magazine**
http://www.wnrmag.com/supps/2003/feb03/run.htm

**Montgomery County Government Services in Maryland**
http://www.montgomerycountymd.gov/mc/services/dep/rainscapes/home.html

## Low Impact & Conservation Web Sites

**Impact Development Center's sizing tool explained:**
http://www.lid-stormwater.net/bioretention/bio_sizing.htm

**Low Impact Development Center, Sustainable School Projects Website**
http://www.lowimpactdevelopment.org/school/index.html

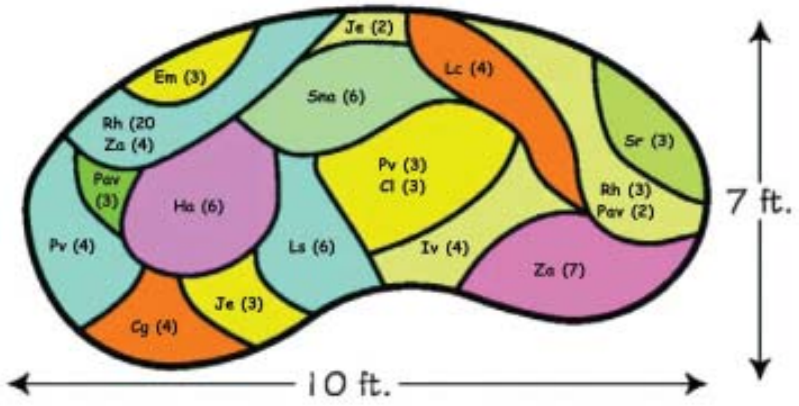
**Prince George's County Maryland (Search for Bioretention)**
http://www.goprincegeorgescounty.com

**Rutgers Cooperative Extension: Restoring NJ Riparian Forest Buffers**
http://www.rce.rutgers.edu/njriparianforestbuffers/index.htm

**Rain Bird Games, Trivia and Water Conservation Activities (Teaching Tool with Answers)**
http://www.rainbird.com/iuow/community/crossword.htm

**10 feet wide;**
**full to partial sun with silt and sandy soils**

**Total Area:**
**70 sq. ft.**




| Symbol | Scientific Name | Common Name | Number of plants |
|---|---|---|---|
| Cl | *Carex lurida* | Shallow sedge | 3 |
| Cg | *Chelone glabra* | White turtlehead | 4 |
| Em | *Eupatorium maculatum* | Spotted joepyeweed | 3 |
| Ha | *Helenium autumnale* | Common sneezeweed | 6 |
| Iv | *Iris versicolor* | Blue flag | 4 |
| Je | *Juncus effusus* | Soft rush | 5 |
| Lc | *Lobelia cardinalis* | Cardinal flower | 4 |
| Ls | *Lobelia siphilitica* | Great blue lobelia | 6 |
| Pav | *Panicum virgatum* | Switchgrass | 5 |
| Pv | *Pycnanthemum virginianum* | Mountain mint | 7 |
| Rh | *Rudbeckia hirta* | Blackeyed Susan | 5 |
| Sg | *Solidago graminifolia* | Flat-top goldenrod | 3 |
| Sna | *Symphyotrichum novae-angliae* | New England Aster | 6 |
| Za | *Zizia aurea* | Golden Alexander | 11 |
| | | **Total Plants Needed:** | **72** |

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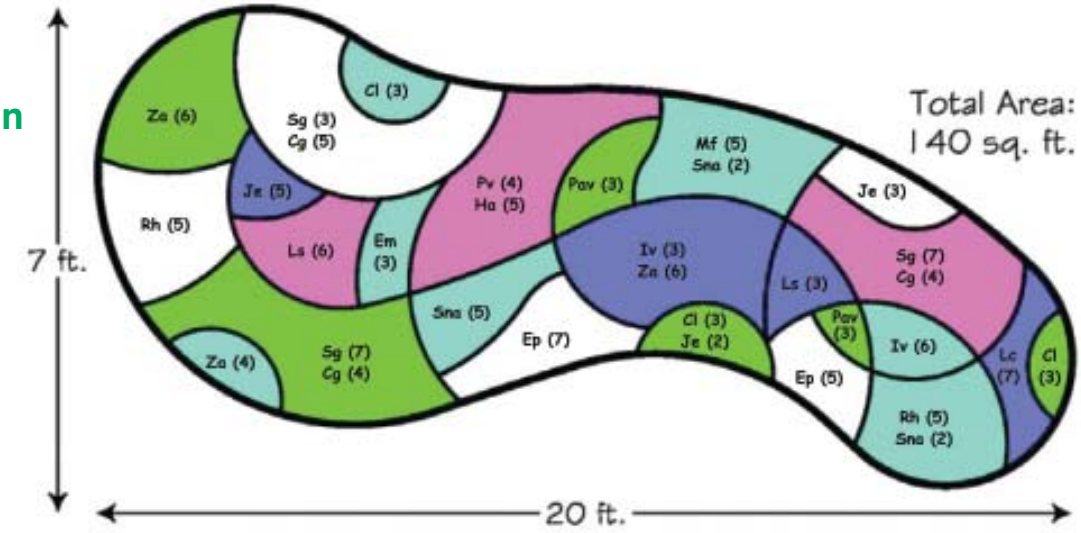
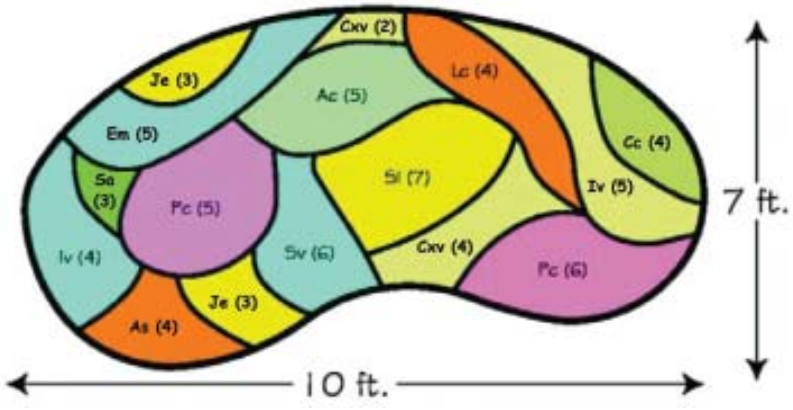
**20 feet wide;**
**full to partial sun with silt and sandy soils**




| Symbol | Scientific Name | Common Name | Number of plants |
|---|---|---|---|
| Cl | *Carex lurida* | Shallow sedge | 9 |
| Cg | *Chelone glabra* | White turtlehead | 13 |
| Ep | *Eupatorium perfoliatum* | Common boneset | 12 |
| Em | *Eupatorium maculatum* | Spotted joepyeweed | 3 |
| Ha | *Helenium autumnale* | Common sneezeweed | 5 |
| Iv | *Iris versicolor* | Blue flag | 9 |
| Je | *Juncus effusus* | Soft rush | 10 |
| Lc | *Lobelia cardinalis* | Cardinal flower | 7 |
| Ls | *Lobelia siphilitica* | Great blue lobelia | 9 |
| Mf | *Monarda fistulosa* | Wild bergmont | 5 |
| Pav | *Panicum virgatum* | Switchgrass | 6 |
| Pv | *Pycnanthemum virginianum* | Mountain mint | 4 |
| Rh | *Rudbeckia hirta* | Blackeyed Susan | 10 |
| Sg | *Solidago graminifolia* | Flat-top goldenrod | 17 |
| Sna | *Symphyotrichum novae-angliae* | New England Aster | 9 |
| Za | *Zizia aurea* | Golden Alexander | 16 |
| | | **Total Plants Needed:** | **144** |

**10 feet wide;**
**full to partial sun with clay soils**

**Total Area:**
**70 sq. ft.**




| Symbol | Scientific Name | Common Name | Number of plants |
|---|---|---|---|
| Ac | *Acorus calamus* | Sweet flag | 5 |
| As | *Asclepias incarnata* | Swamp milkweed | 4 |
| Cc | *Carex crinita* | Fringed sedge | 4 |
| Cxv | *Carex vulpinoidea* | Fox sedge | 6 |
| Em | *Eupatorium maculatum* | Spotted joepyeweed | 5 |
| Iv | *Iris versicolor* | Blue flag | 9 |
| Je | *Juncus effusus* | Soft rush | 6 |
| Lc | *Lobelia cardinalis* | Cardinal flower | 4 |
| Pc | *Pontederia cordata* | Pickerel weed | 11 |
| Sl | *Sagittaria latifolia* | Arrowhead | 7 |
| Sa | *Scirpus palidus* | Cloaked bulrush | 3 |
| Sv | *Scirpus validus* | Soft-stemmed bulrush | 6 |
| | | **Total Plants Needed:** | **70** |

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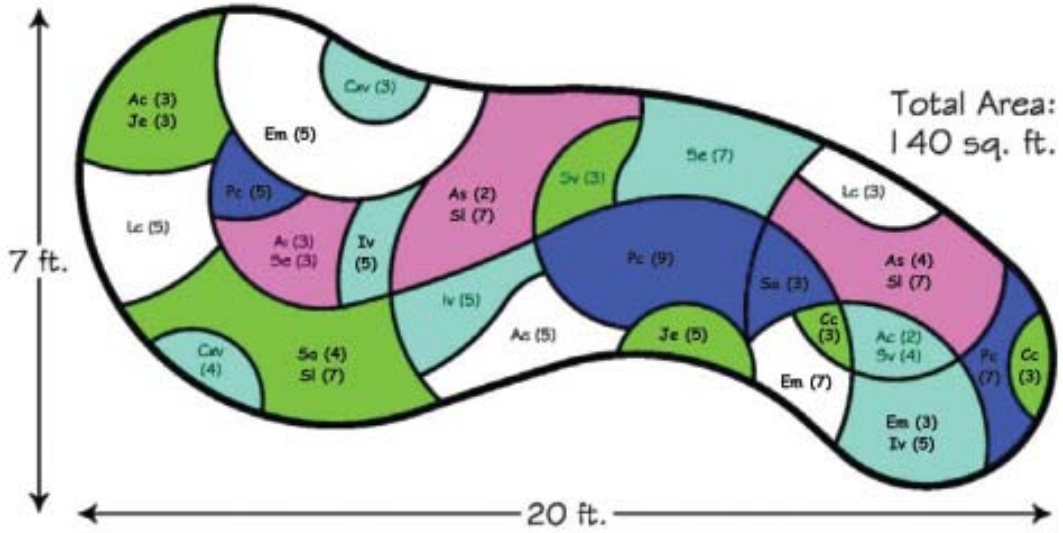
**20 feet wide;**
**full to partial sun with clay soils**




| Symbol | Scientific Name | Common Name | Number of plants |
|---|---|---|---|
| Ac | *Acorus calamus* | Sweet flag | 10 |
| As | *Asclepias incarnata* | Swamp milkweed | 9 |
| Cc | *Carex crinita* | Fringed sedge | 6 |
| Cxv | *Carex vulpinoidea* | Fox sedge | 7 |
| Em | *Eupatorium maculatum* | Spotted joepyeweed | 15 |
| Iv | *Iris versicolor* | Blue flag | 15 |
| Je | *Juncus effusus* | Soft rush | 8 |
| Lc | *Lobelia cardinalis* | Cardinal flower | 8 |
| Pc | *Pontederia cordata* | Pickerel weed | 21 |
| Sl | *Sagittaria latifolia* | Arrowhead | 21 |
| Sa | *Scirpus palidus* | Cloaked bulrush | 7 |
| Sv | *Scirpus validus* | Soft-stemmed bulrush | 7 |
| Se | *Sparganium eurycarpum* | Bur-reed | 10 |
| | | **Total Plants Needed:** | **144** |