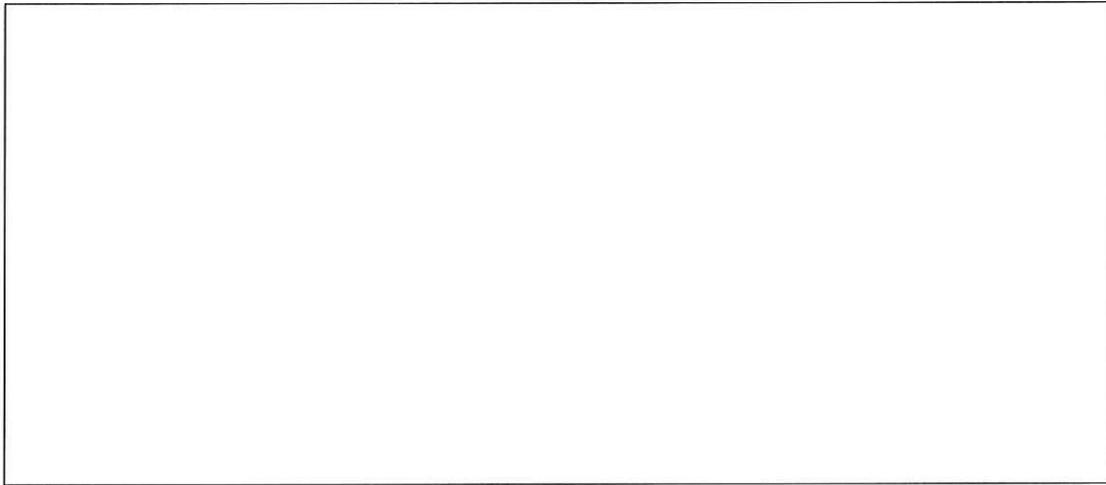
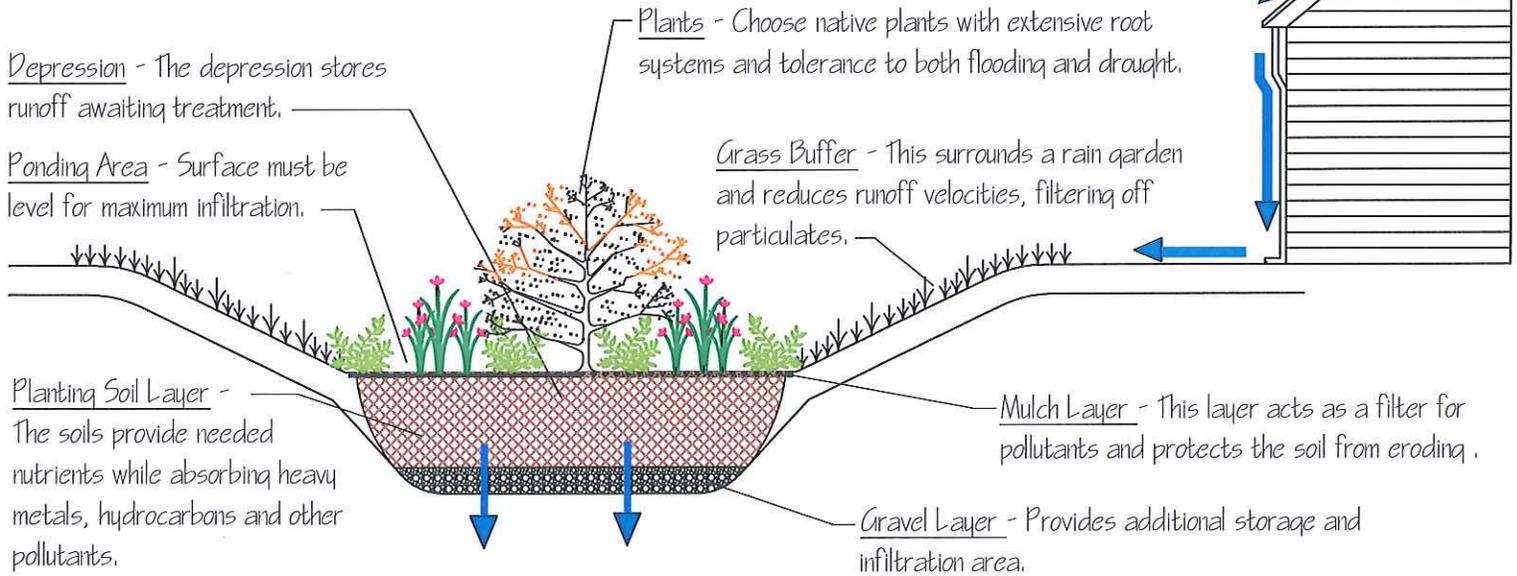


# RAIN GARDEN AT GOSHEN VILLAGE HALL



A rain garden constructed at Maplewood, Goshen's Village Hall.  
(Photo to be inserted at a later date)

A rain garden is a shallow depression planted with perennial native plants that are tolerant of both dry and wet conditions. Rain gardens are designed to collect runoff from impervious surface areas such as rooftops and driveways and allow it to seep slowly into the ground. Rain gardens help preserve nearby streams and ponds by filtering common pollutants in stormwater and thereby reducing the amount of pollutants in runoff.



TYPICAL RAIN GARDEN DETAIL

## Did you know?

- ... A rain garden allows up to 30% more water to soak into the ground than a typical patch of lawn.
- ... An average home roof of 2,000 square feet generates 1,300 gallons of stormwater runoff during a single 1" rainfall event.
- ... Rain gardens can be effective at eliminating many common pollutants of concern such as total suspended solids, phosphorus, nitrates, lead, zinc and copper.

## FOR MORE INFORMATION ON RAIN GARDENS:

- Visit Village Hall, 276 Main Street, Goshen, NY 10924
- Go to <http://www.villageofgoshen-ny.gov/> and click on Rain Garden

VILLAGE OF GOSHEN WEBSITE LINKS:

<http://www.massaudubon.org/PDF/sanctuaries/broadmeadow/RainGardenBrochure.pdf>

[http://www2.erie.gov/environment/sites/www2.erie.gov.environment/files/uploads/pdfs/ECS\\_Rain%20Garden%20Booklet.pdf](http://www2.erie.gov/environment/sites/www2.erie.gov.environment/files/uploads/pdfs/ECS_Rain%20Garden%20Booklet.pdf)

<http://www.ocsoilny.org/rain-gardens.html>

<http://www.ocsoilny.org/stormwater-information.html>

Link to "Rain Garden Plant Identification" drawing to be put together after garden is planted.

**RAIN GARDEN PLANT IDENTIFICATION**



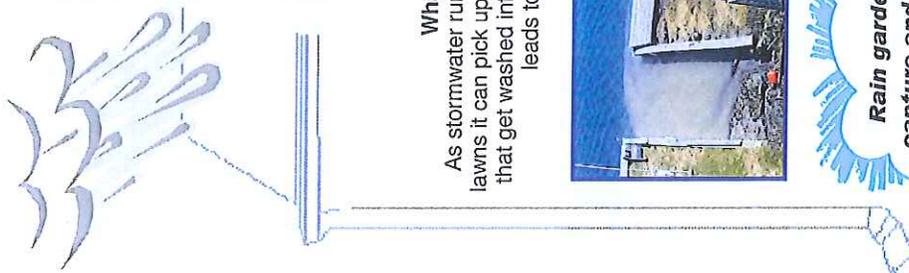
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- » IM2 Architecture
- » Meliora Environmental Design
- » Andropogon Associates
- » Bruce E. Brooks & Associates
- » Ann Rothmann Structural

*This can be put together as a web page after the garden is built*

# Garden for Cleaner Water



**What is stormwater runoff?**  
 Stormwater runoff is the water that runs over and off the land during a rainstorm or snowmelt, rather than soaking in.



**What's the problem?**  
 As stormwater runs over streets, parking lots, and lawns it can pick up and carry many kinds of materials that get washed into nearby streams and lakes. This leads to stormwater pollution!



**Where do these pollutants come from?**

- Stormwater picks up contaminants that come from all of us-
- Fertilizers
  - Pesticides
  - Bacteria from pet waste
  - Eroded soil
  - Road salt
  - Grass clippings
  - Litter

**Rain gardens capture and filter stormwater**

Just to name a few!

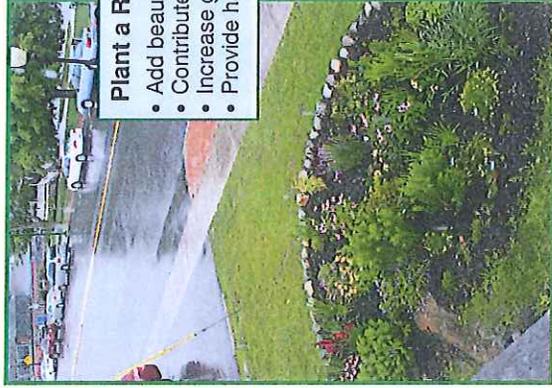


Rain gardens are a beautiful and beneficial addition to any landscape. By capturing rain water, they help to reduce stormwater pollution and protect local streams, lakes, and rivers.



**Plant a Rain Garden of Your Own!**

- Add beauty & interest to your yard.
- Contribute to cleaner water.
- Increase groundwater recharge.
- Provide habitat for butterflies & wildlife.



Looking down from the roof, rain water can be seen entering this rain garden in the bottom left hand corner of the photo. The garden not only captures water, allowing it to soak into the ground, but also adds an element of beauty to the neighborhood.

Funding was provided by an Onondaga Lake Partnership "Mini-Grant" through EPA Region II, and USDA Cooperative State Research, Education, and Extension Service Regional Water Quality Project, Region 2. Funding for a second printing was provided by the City of Syracuse, Department of Water, and the Onondaga County Environmental Health Council.

For more information about rain gardens, or how to design and construct one for your own yard, contact:

**CORNELL COOPERATIVE EXTENSION OF ONONDAGA COUNTY**  
 220 Herald Place, 2nd Floor, Syracuse NY 13202  
 Phone: (315) 424-9485  
 Email: [onondaga@cornell.edu](mailto:onondaga@cornell.edu)  
 Web: [www.cce.cornell.edu/onondaga](http://www.cce.cornell.edu/onondaga)



# An Introduction to Rain Gardens



**Cornell University**  
 Cooperative Extension  
 Onondaga County

*Building Strong and Vibrant New York Communities.*

*Cornell Cooperative Extension provides equal program and employment opportunities. Employment and program opportunities are offered to all people, regardless of race, color, national origin, gender, age or disability.*



WNY  
Stormwater  
Coalition

Goal: Utilize regional collaboration to identify existing resources and develop programs to reduce the negative impacts of stormwater pollution. This rain garden project is just one example in the effort to reduce stormwater pollution.

The following communities and agencies participate in the Western New York Stormwater Coalition:

Erie County

- |                         |                  |                   |
|-------------------------|------------------|-------------------|
| Alden (V)               | Depew (V)        | Lancaster (V)     |
| Alden (T)               | East Aurora (V)  | Lancaster (T)     |
| Amherst (T)             | Eden (T)         | Orchard Park (V)  |
| Angola (V)              | Elma (T)         | Orchard Park (T)  |
| Aurora (T)              | Evans (T)        | Sloan (V)         |
| Biascell (V)            | Grand Island (T) | Tonawanda (C)     |
| Boston (T)              | Hamburg (V)      | Tonawanda (T)     |
| Buffalo Sewer Authority | Hamburg (T)      | West Seneca (T)   |
| Cheektowaga (T)         | Kenmore (V)      | Williamsville (V) |
| Clarence (T)            | Lackawanna (C)   |                   |

Niagara County

- |                           |                     |
|---------------------------|---------------------|
| Cambria (T)               | North Tonawanda (C) |
| Lewiston (V)              | Pendleton (T)       |
| Lewiston (T)              | Porter (T)          |
| Niagara (T)               | Wheatfield (T)      |
| Niagara Falls Water Board | Youngstown (V)      |

Agencies and Consultants

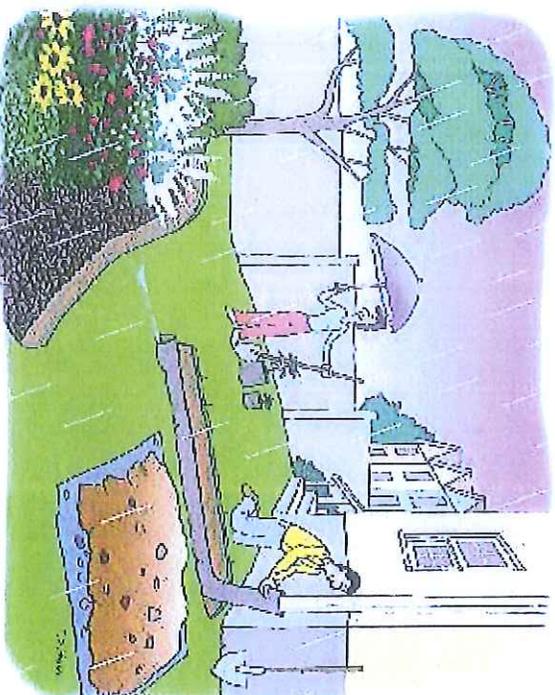
- |   |                           |
|---|---------------------------|
| Erie County DEP/DPW/DSM                           | Foite Albert              |
| Niagara County DPW                                | Malcolm Pirnie            |
| Peace Bridge Authority                            | Marquis Engineering       |
| SUNY at Buffalo                                   | Metzger Civil Engineering |
| Buffalo Niagara Riverkeeper                       | Nussbaumer & Clarke, Inc. |
| Erie County Soil & Water Conservation District    | Parsons                   |
| Niagara County Soil & Water Conservation District | Stearns & Wheeler         |
| Connie D. Miner & Co., Grant Consultant           | TVGA Consultants          |
| CRA Infrastructure & Engineering                  | Wm. Schutt & Associates   |
| Environmental Design & Research, PC               | Wendel Duchschrer         |

**Funding for the Rain Garden Demonstration Project was provided by:**

- New York State Soil & Water Conservation Committee
- New York State Department of Environmental Conservation
- Erie County Water Quality Committee
- Western New York Stormwater Coalition

# RAIN GARDENS

## A HOW-TO GUIDE



Western New York Stormwater Coalition



Erie County Water Quality Committee  
Erie County Department of Environment & Planning

## Stormwater Pollution Awareness

A growth in urbanization has caused an increase in impervious surfaces. The result of this is an increase in stormwater runoff.

Stormwater runoff is defined as rain, melted snow and ice from a roof, driveway or any type of impervious surface. Stormwater collects in a storm sewer system and empties into our local waterways.

Along the way, stormwater collects many pollutants such as road salt, heavy metals, and oils, which can harm water quality and aquatic life. One way to decrease stormwater pollution and encourage rainwater to infiltrate into the ground is a RAIN GARDEN!



### What is a rain garden?

A rain garden is a shallow depression planted with native plants and flowers.

A rain garden is designed to collect and absorb rain and snowmelt from roofs, sidewalks, driveways, and lawns allowing it to seep naturally into the ground. A rain garden allows up to 30% more water to soak into the ground than a typical patch of lawn. A rain garden is beneficial because it will:

- Recharge local groundwater
- Reduce mosquito breeding by removing standing water
- Create a habitat for birds and butterflies
- Reduce the potential of home flooding
- Protect rivers and streams



When you make a rain garden you can help improve local water quality while creating a beautiful natural area.

## Plant Selection

Native plants and flowers are strongly recommended for your rain garden because these plants have the greatest chance of growth and survival in Western New York. A listing of native plants which require different amounts of sunlight is shown below along with native trees and shrubs:

### Wildflowers - Full Sun

- Swamp milkweed (*Asclepias incarnate*)
- Little Blue Stem (*Andropogon Scoparius*)
- Side Oats Grama (*Bouteloua curtipendula*)
- Partridge Pea (*Chamaecrista fasciculata*)
- Big Bluestem (*Andropogon gerardii*)
- Black Eyed Susan (*Rudbeckia hirta*)
- Wild Senna (*Senna hebecarpa*)
- Wild Blue Lupine (*Lupinus perennis*)
- Beard Tongue (*Penstemon digitalis*)
- Smooth Blue Aster (*Aster laevis*)



### Wildflowers - Partial Shade

- Joe-pye weed (*Eupatorium maculatum*)
- Blue lobelia (*Lobelia sylvatica*)
- Silky Wild Rye (*Elymus villosus*)
- Indian Grass (*Sorghastrum nutans*)
- Ox Eye Sunflower (*Helianthus helianthoides*)
- Wild Blue False Indigo (*Baptisia australis*)



### Trees and Shrubs:

- Burtonbush (*Cephalanthus occidentalis*)
- Silky dogwood (*Cornus amomum*)
- Winterberry holly (*Ilex verticillata*)
- American elderberry (*Sambucus Canadensis*)
- Arrowwood (*Viburnum dentatum*)



## 4. Construction

Start by laying string around the perimeter of the garden. Place stakes along the up-slope and down-slope sides, lining them up proportionally every 5 feet. Tie a string to the up-slope stake at ground level. Tie it to the stake down-slope so that the string is level. Start digging at the up-slope side of the garden. Dig until you reach the depth you want the rain garden to be. When digging the rain garden to the suggested depth, slope the sides and edges using the remaining soil to build a berm (a mound of earth). If the lawn is flat, dig the same depth throughout the garden and use the soil for the berm.



A berm is needed to trap the water in the rain garden. The berm should be along the downhill side of the garden. The berm should be well-compacted and have smoothly sloping sides. To prevent erosion of the berm, cover it with mulch or plant grass. If planting grass, use straw or an erosion control mat to protect the berm from erosion.

One to two inches of compost may be added to help the plants establish themselves. If compost is used, the rain garden can be one or two inches deeper than originally planned. The soil ideally should be a mixture of 50% sand, 20-30% organic matter (compost or fine mulch), and 20-30% top soil (original material).

## 5. Maintenance

The rain garden will need to be watered every other day for 2 weeks until the plants are established. After 2 weeks, watering is not required, except during extended periods of dry weather. Weeding will be necessary for the first two years. By the third year and beyond, the native grasses, sedges, rushes, and wildflowers will begin to mature and decrease the amount of weeds. As spring arrives and new growth reaches 4-6 inches tall, cut all tattered plants back.

## Designing your Rain Garden

### 1. Location

The following factors should be considered when selecting a location for your rain garden:

- Locate an area at least 10 ft. from the house to prevent household flooding.
- Do not plant over gas or water/sewer services.
- Pick an area where the garden will be in full or partial sun.
- Do not pick a location where water ponds.
- Select a location where the slope is 3-4% (generally preferred). For a location which has a slope of 12% or higher, a rain garden should not be planted.
- A rain garden is typically 100 to 300 square feet. The garden should be twice as long as it is wide.
- Soil should have good drainage. To evaluate the drainage capability of your soil, perform a simple drainage test by doing the following:
  1. Dig a hole 8" deep and 8" wide.
  2. Pour a bucket of water into the hole and see how long it takes to infiltrate. The water level should decrease 1 inch per hour.

### 2. Size & Depth

The following variables need to be determined when sizing your rain garden:

- Roof Area
- Drainage Area
- Size Factor
- Rain Garden Area
- Slope

**How to Determine these Variables:**

First, calculate the roof area by measuring the width and length of your roof and multiplying them. Next, count the number of downspouts on your house. Determine drainage area by using the following equation:

$$\text{Drainage Area} = \text{Roof Area} \div \# \text{ of Downspouts}$$

To determine a size factor for your rain garden, the type of soil and distance from the downspout needs to be identified. The size factor is needed to calculate the total rain garden area (see Tables 1 & 2 to determine size factor).

**Table 1: Size factors for rain gardens less than 30 feet from downspout**

Soil Type	3-5 in. deep	6-7 in. deep	8 in deep
Sand	0.19	0.15	0.08
Silt	0.34	0.25	0.16
Clay	0.43	0.32	0.20

**Table 2: Size factors for rain gardens more than 30 feet from downspout.**

Soil Type	Size Factor
Sand	0.03
Silt	0.06
Clay	0.10

Once the drainage area and size factor are known, the total rain garden area of the garden can then be determined using the following equation:

$$\text{Rain Garden Area} = \text{Drainage Area} \times \text{Size Factor}$$

For example, if a 200 ft<sup>2</sup> area was calculated, the dimensions of the rain garden would have a length of 10 ft. and width of 20 ft.

The last factor to identify is the slope. The slope of the area can be determined by putting a stake on the uphill and downhill side of the garden. The slope can then be found by using the following equation:

$$\% \text{ slope} = (\text{Change in height} \div \text{Change in Width}) \times 100$$

Once the slope is obtained, the depth of the rain garden can be found using Table 3.

**Table 3: Determining the Depth of the Garden**

%Slope (in.)	Depth (in.)
≤4	3-5
5-7	6-7
8-12	8-12

A grass swale or PVC pipe can be installed to direct the flow from your downspout to your rain garden. The PVC pipe should be placed at least 6 inches underground inside the rain garden.

### 3. Design

Create a simple design on paper according to the rain garden area calculated. When selecting native plants, consider the height, bloom time, color, and texture of each plant. When placing the plants, make sure you have three seasons of bloom represented. By mixing the heights, shapes, and textures you will give the garden depth and dimension. This will make the rain garden look more appealing between bloom periods.



To provide a bolder statement of color to the garden, randomly bunch together individual species in groups of 3 to 7 plants. The number of plants needed can be found by multiplying the rain garden area (pg. 3) by 0.75. On average, there ought to be one plant for every one to two feet. A diverse mixture of sedges, rushes, and grasses in the garden will create necessary root competition. The plants will then follow their normal growth patterns and will not try to outgrow or out-compete other species. To enhance your rain garden, use local or existing stone, ornamental fences, trails, garden

## How to Create a Rain Garden

*Designing and planting a rain garden is much like creating any other perennial garden, with a few unique differences.*

- ◆ The garden must be located where runoff can be diverted into it, at least 10 feet away from building foundations and septic systems.
- ◆ A shallow, saucer-shaped depression is created in the garden to hold rain as it soaks in. The garden should be about 20-30% of the area from which it is receiving runoff.
- ◆ Soil replacement and additional preparations are sometimes needed for success. A good soil mix for rain gardens is 50-60% sand, 20-30% topsoil, and 20-30% compost.
- ◆ Species of perennial plants and shrubs native to our region are recommended, as they are adapted to local conditions and will not need extra care once they are established. Plant flood tolerant species in the center and drought tolerant ones around the edges. Berry-bearing and nectar-producing plants attract and nourish wildlife.
- ◆ A mulch of shredded hardwood is an integral part of your rain garden. It keeps the soil moist and ready to soak up rain, and makes your garden low-maintenance.

**Did You Know?** The average home roof is 1,300 square feet and generates 832 gallons of runoff during a single 1" rainfall event.

### Rain Garden Resources

New England Wildflower Society:  
<http://www.newfs.org/publications-and-resources/rain-gardens.html>

URI Healthy Landscapes:  
[www.uri.edu/ce/healthylandscapes/raingarden.htm](http://www.uri.edu/ce/healthylandscapes/raingarden.htm)

University of Connecticut Extension Service:  
[www.sustainability.uconn.edu/pdf/raingardenbroch.pdf](http://www.sustainability.uconn.edu/pdf/raingardenbroch.pdf)

Natural Resources Conservation Service:  
[www.ia.nrcs.usda.gov/features/raingardens.html](http://www.ia.nrcs.usda.gov/features/raingardens.html)



### Going Green with Storm Water: Rain Gardens



**Broad Meadow Brook Conservation Center  
And Wildlife Sanctuary**  
414 Massachusetts Road  
Worcester, MA 01604

Phone: 508-753-6087  
Fax: 508-755-0148  
[www.massaudubon.org](http://www.massaudubon.org)

This brochure is partially funded by an EPA  
Healthy Communities Grant

## Going Green with Storm Water

### Rain Gardens



#### ABest Management Practice to:

- ◆ Reduce Stormwater Runoff
- ◆ Improve Water Quality
- ◆ Enhance Your Landscape

Make your own beautiful contribution to  
cleaner water in the Blackstone River  
Watershed.

Come visit Broad Meadow Brooks  
Demonstration  
Rain Garden



## What is a Rain Garden?

A rain garden is a shallow depression planted with perennial native plants that are tolerant of both dry and wet conditions. Rain gardens capture runoff from impervious surface areas such as rooftops and driveways and allow it to seep slowly into the ground. Most importantly, rain gardens help preserve nearby streams and ponds by reducing the amount of polluted runoff and filtering pollutants.

## Why Plant a Rain Garden?

Stormwater runoff from residential areas often contains excess lawn and garden fertilizers, pesticides and herbicides, oil, yard wastes, sediment and animal wastes which cause water pollution.

Rain gardens fill with stormwater and allow the water to slowly filter into the ground rather than running off into storm drains, and eventually into streams and lakes.

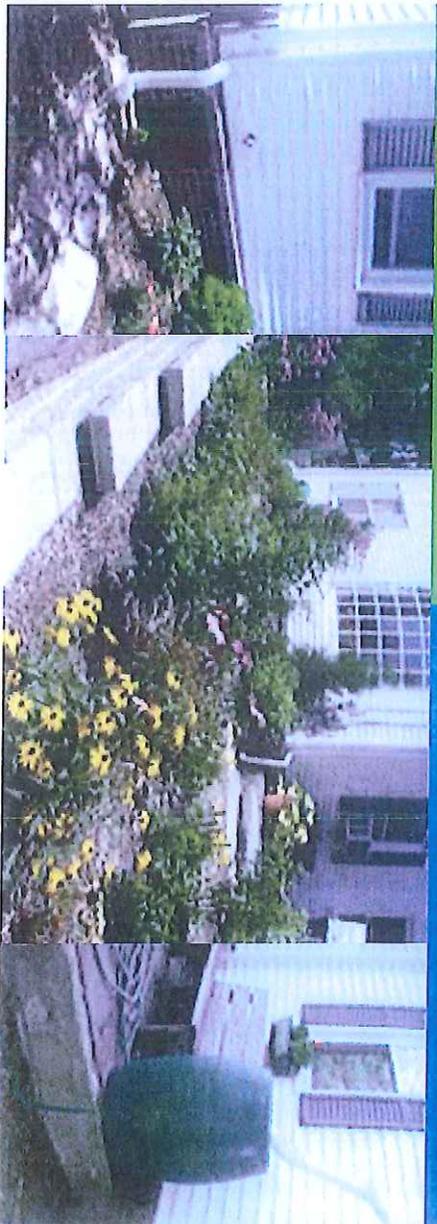
Rain gardens reduce peak storm flows, helping to prevent stream bank erosion and lowering the risk for local flooding.

By collecting and using rainwater that would otherwise run off your yard, you not only return rain to the water table, but you are also creating a beautiful solution to water pollution.



## The Rain Garden at Broad Meadow Brook Conservation Center

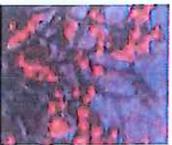
The rain garden captures roof runoff from three downspouts, and a rain barrel captures the fourth. We use water from the rain barrel to irrigate when necessary.



We chose a variety of native plants that provide color and interest throughout the growing season. They produce nectar and berries to attract wildlife such as butterflies, hummingbirds, cedar waxwings and winter robins.

### Plant List:

- |                    |                    |
|--------------------|--------------------|
| <b>Shrubs:</b>     | <b>Perennials:</b> |
| Sweet Pepperbush   | Dwarf Aster        |
| Dogwood            | Swamp Milkweed     |
| Shamrock Inkberry  | Joe Pye Weed       |
| Winterberry        | Coneflower         |
| Gro-Low Sumac      | Blazing Star       |
| Lowbush Blueberry  | Beebalm            |
| Highbush Blueberry | Blackeyed Susan    |
| Dwarf Fothergilla  | Crested Iris       |
| Slender Deutzia    | Foamflower         |
| Potentilla         | Yarrow             |
|                    | Sea Oats           |



Mass Audubon is a lead partner in the Blackstone River Coalition (BRC) and the Campaign for a Fishable/Swimmable Blackstone River by 2015. All of Worcester's waterways, including Broad Meadow Brook, are headwater tributaries to the Blackstone. To further implement the Campaign, the BRC is targeting polluted runoff and stormwater volume as the major issue impacting water quality.

The BRC's "Tackling Stormwater in the Blackstone River Watershed" Initiative is a four-pronged approach focusing on homeowners, municipal decision makers, developers, and businesses. See [www.zaphthblackstone.org](http://www.zaphthblackstone.org) for details.

Remember that anything that enters a storm drain in the road is discharged untreated into the water bodies we use for swimming, fishing, paddling, and recharging our drinking water supplies. The more we can all do to reduce stormwater impacts to our waterways, the healthier they will be.

