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

Niagara County

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

Agencies and Consultants

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

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 syphilitica)
Silky Wild Rye (Elymus villosus)
Indian Grass (Sorghastrum nutans)
Ox Eye Sunflower (Heliopsis helianthoides)
Wild Blue False Indigo (Baptisia australis)

Trees and Shrubs:

Buttonbush (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:

Drainage Area = Roof Area ÷ # 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:

Rain Garden Area = Drainage Area x Size Factor

For example, if a 200 ft^2 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:

% slope = (Change in height ÷ Change in Width) x 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