

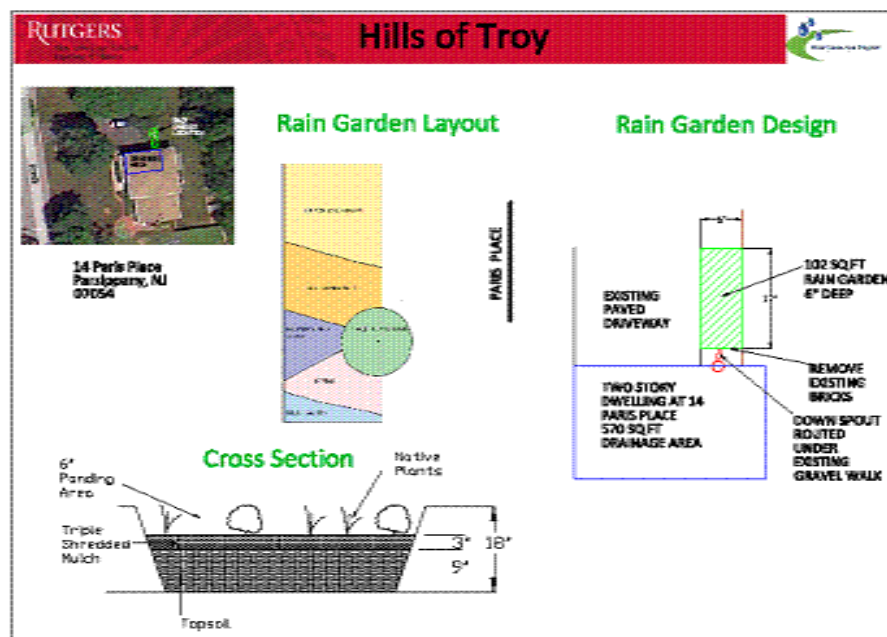


# Cluster Rain Garden Project Implementation of the Troy Brook Regional Stormwater Management Plan—Part B, Voluntary Measures. RP08-056

## Dinesh Chheda Rain Garden Maintenance Manual



Photo courtesy  
Ingrid Witty,  
Environmental  
Steward



Layout design  
Rutgers Water  
Resources  
Program. .

Maintenance Manual developed by Pat Rector and Ingrid Witty. Power Point presentation on maintenance developed by the Water resources Program Rutgers Cooperative Extension.

# Acknowledgements

This project was the culmination of earlier projects and the dedication of many people, groups and associations along the way.

Dr. Christopher Obropta, who had the foresight and dedication to bring Rain Gardens to the Garden State and to be the force to keep them planting.

Dr. Christopher Obropta and Dr. Sandra Goodrow and all the partners who participated in the development of the Troy Brook Regional Stormwater Management Plan: for the ability to see the Big Picture and know how stormwater should be handled; especially Ray Zabihach, formerly of Morris County Planning.

The Whippany River Watershed Action Committee. You did it again guys. First Regional Stormwater Management Plan and now First Residential Cluster Rain Garden Project. For always being dedicated partners, out there ahead of the curve.

The Township of Parsippany-Troy Hills for assistance and partnership whether the rain garden is in their own municipal back yard or in the Hills of Troy.

And to the 5 residents of the Hills of Troy who took the leap– and were willing to say YES to improving water quality by partnering with Rutgers to have a rain garden demonstration project installed on their property.

Thank you to all the dedicated partners in the Troy Brook Watershed. This is how clean water happens.

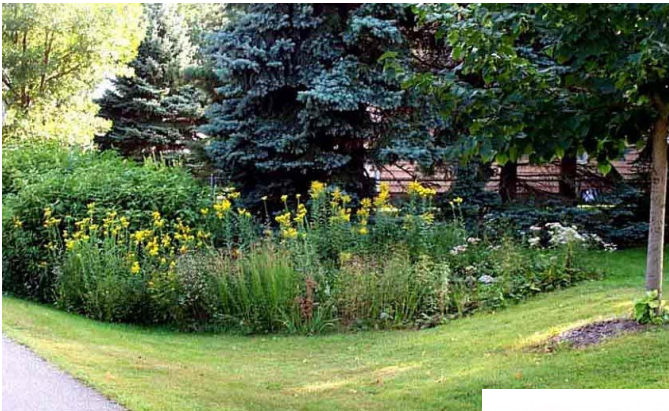
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# What is a Rain Garden?

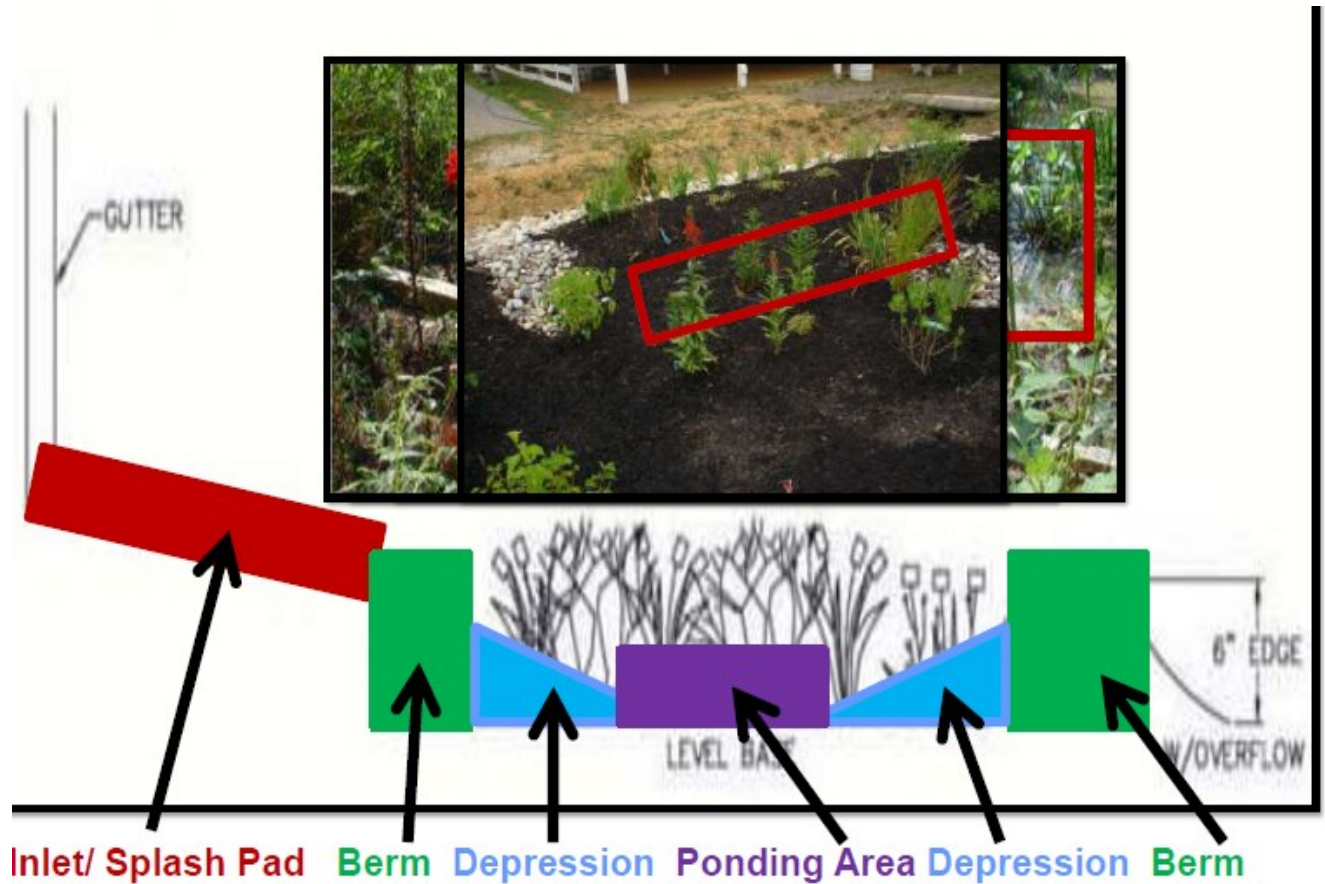
What is a Rain Garden?

A rain garden is a landscaped, shallow depression that allows rain and snowmelt to be collected and seep naturally into the ground. This helps recharge our groundwater supply and prevents a water quality problem called polluted runoff (nonpoint source pollution). Rain gardens are an important way to make our cities and neighborhoods more attractive and sustainable.



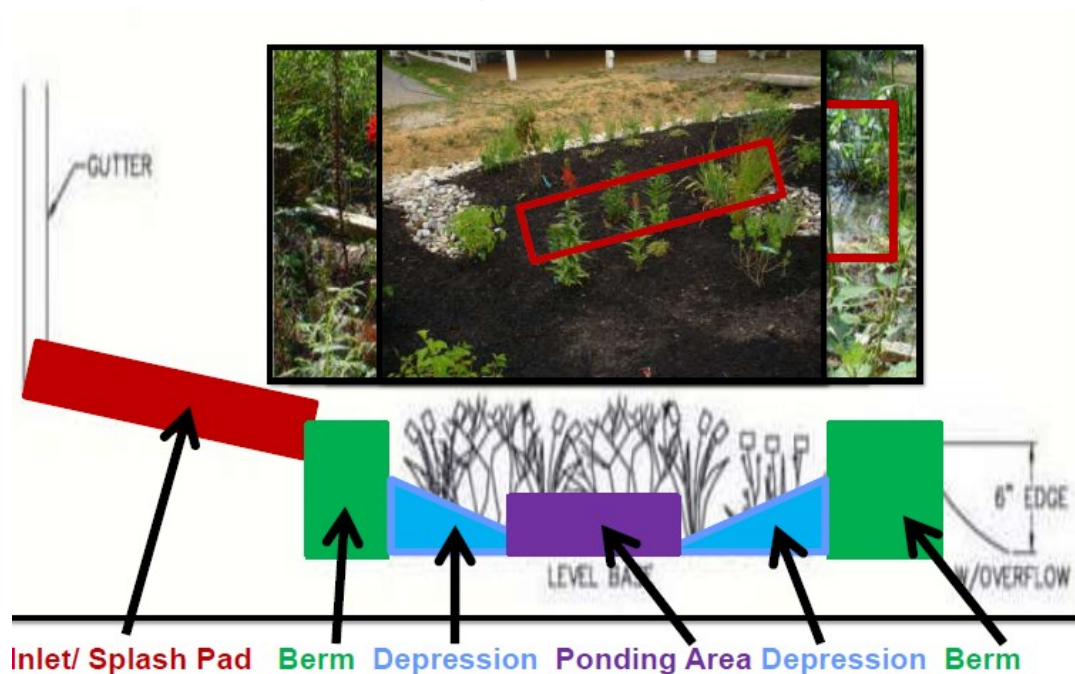
# What is a Rain Garden?

## Sections of a Rain Garden





# What is a Rain Garden?



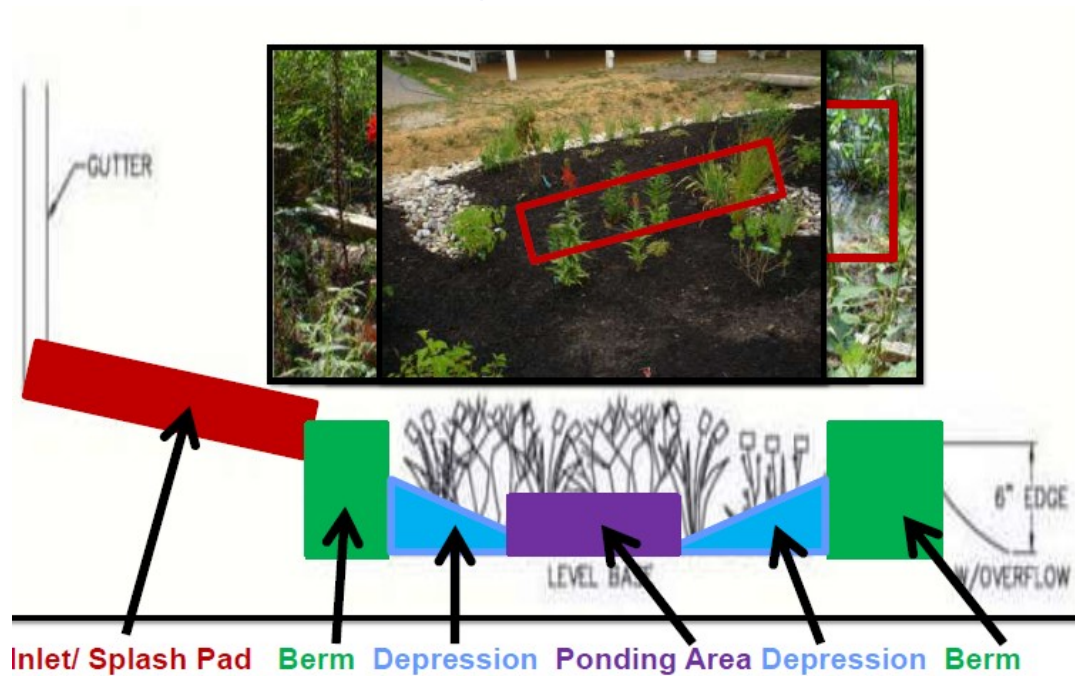
<http://plants.usda.gov>

## Types of Plants

Your Rain Garden is composed of woody plants (trees and shrubs) and herbaceous species (flowers, grasses, and ground covers) planted in three wetness zones.



# What is a Rain Garden?



Examples of plants that will do well in the ponding area. Further information is available through the references listed at the end of this manual.

## Lowest Zone/Ponding Area Native Plants



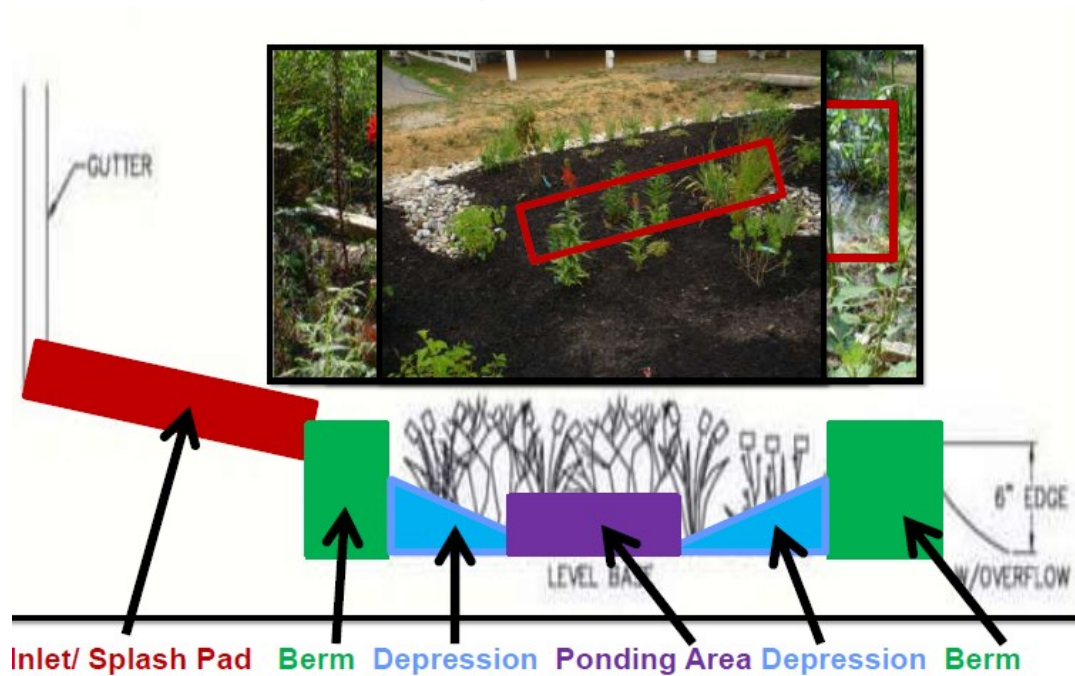
Marsh Marigold  
*Caltha palustris*



Rose Mallow  
*Hibiscus palustris*



# What is a Rain Garden?



Examples of plants that will do well in the middle depression area. Further information is available through the references listed at the end of this manual.

## Middle Zone/Depression Area Native Plants



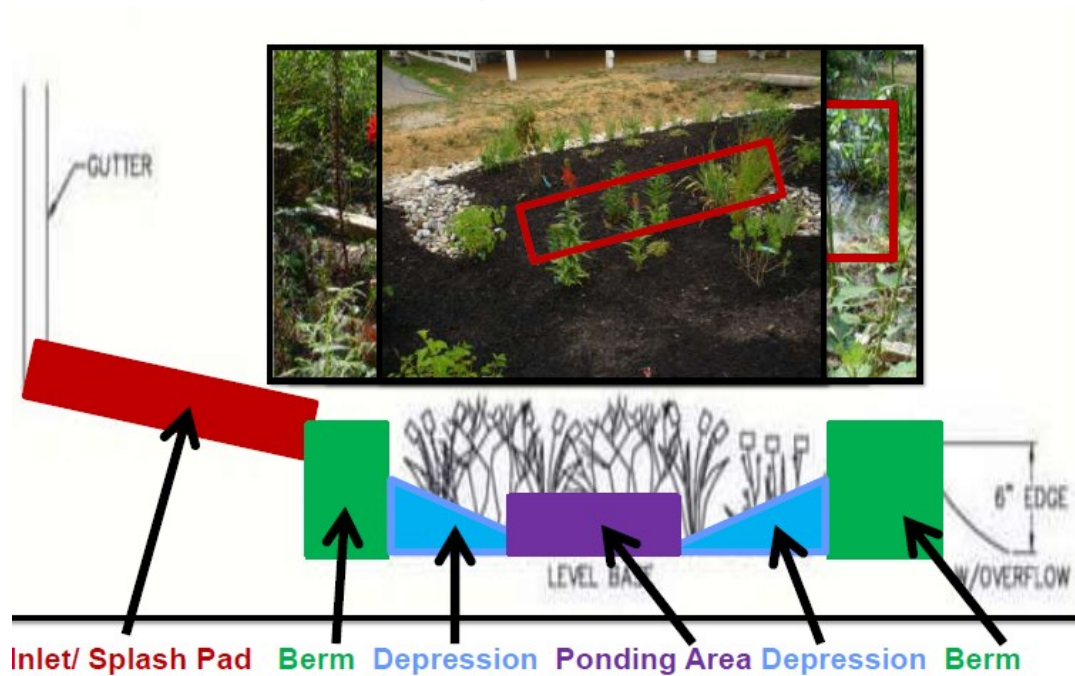
Joe Pye Weed  
*Eupatorium purpureum*



Obedient Plant  
*Physostegia virginiana*



# What is a Rain Garden?



Examples of plants that will do well in the middle depression area. Further information is available through the references listed at the end of this manual.

## Highest Zone/Upland Area Native Plants

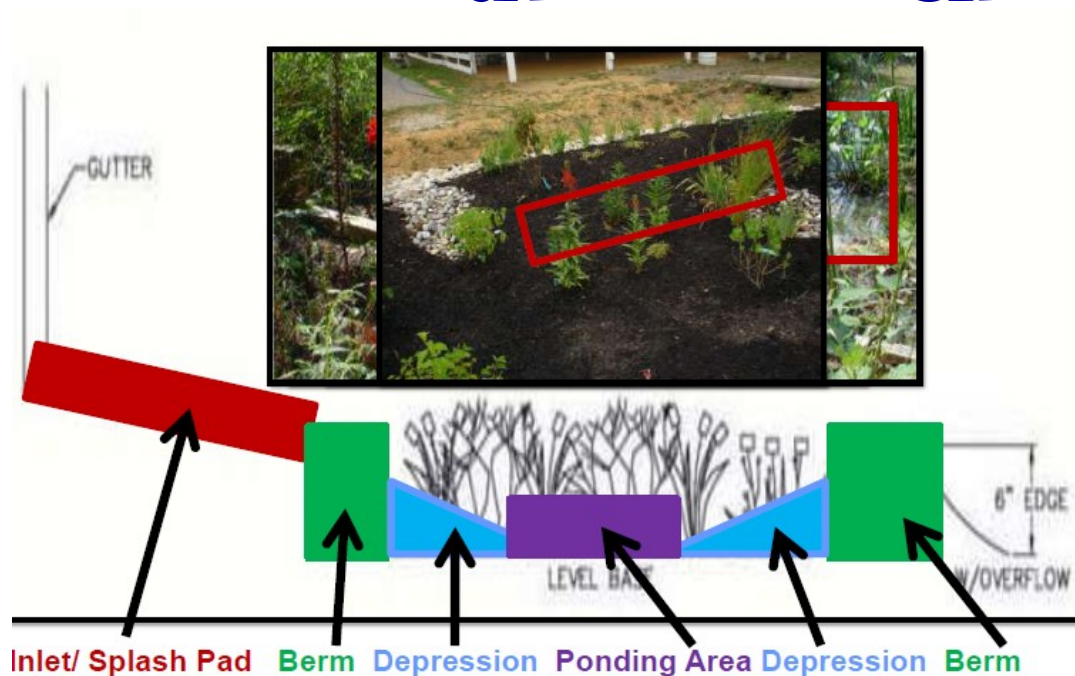


Black Eyed Susan  
*Rudbeckia hirta*



Bee Balm  
*Monarda didyma*

# What is a Rain Garden?



## Amount of Mulch Required for a Three Inch Thick Layer

Size of Rain Garden	Approximate Amount of Mulch
25 square feet	0.25 cubic yard
50 square feet	0.50 cubic yard
100 square feet	1.0 cubic yard
200 square feet	2.0 cubic yards

*Triple-shredded Hardwood with No Dye*



Springfield Municipal Annex Building, Union County

# Percolation Test

	Dinesh	14 Paris Place
	Time	Depth (inches)
1st hour	12:30	11
2nd hour	1:30	7
3rd hour	2:30	4.5
4th hour	3:30	0
Percolation Rate (inches/hours		<b>2.75</b>



## Plants in the Dinesh Rain Garden

Common name	Scientific name	Number provided in garden
Blue Flag Iris	<i>Lobelia Siphilitica</i>	7
Boneset	<i>Eupatorium Perfoliatum</i>	6
Brown-eyed Susan	<i>Rudbeckia Triloba</i>	5
False Sunflower	<i>Heliopsis Hekianthoides</i>	5
New England Aster	<i>Aster Novae-Angliae</i>	4

# **Iris Versicolor**

## **Blue Flag Iris**

Foliage and Summer Flower



Picture/Text Credit: Lady Bird Johnson Wildflower Center  
The University of Texas at Austin  
Photographer: Hixson, John

**Characteristics:** Herbaceous, Perennial

**USDA Native Status:** Native to US

### **Appearance:**

**Height** – 2-3 ft.

**Flower Color** – Blue, and Purple

**Flowering Period** – May, June, July and August

**Light Requirement:** Sun, Part shade

**Habitat (Community):** Meadows; stream banks; marshes; swamps

### **Hydrology:**

**Indicator status** – OBL Obligate wetland species

**Wildlife Benefits:** Attracts Hummingbirds

**Distribution USA:** CT , DE , ID , IL , ME , MD , MA , MI , MN , NH , NJ , NY , OH , PA , RI , VT , VA , WI , DC

**Canada:** MB , NB , NL , NS , ON , PE , QC , SK

**Native Distribution:** S. Lab. to Man, s. to w. VA, n. OH, MI & MN

**USDA Native Status:** L48(N), CAN(N), SPM(N)

# *Eupatorium Perfoliatum*

## Boneset

Foliage and Summer/Fall Flower



Picture Credit: Lady Bird Johnson Wildflower Center  
The University of Texas at Austin  
Photographer: Bransford, W.D. Mrs.

**Characteristics:** Herbaceous, Perennial

### **Appearance:**

**Height** – 3 - 6 ft.

**Flower Color** – White

**Flowering Period** – June through October

**Light Requirement:** Sun, Part Shade

**Habitat (Community):** Damp prairies; alluvial woods; bogs

### **Hydrology:**

**Indicator status** – UPL Obligate Upland

**Wildlife Benefits:** (Nectar) food for bees, and butterflies, and attracts birds.

**Distribution USA:** AL , AR , CT , DE , FL , GA , IL , IN , IA , KS , KY , LA , ME , MD , MA , MI , MN , MS , MO , NE , NH , NJ , NY , NC , ND , OH , OK , PA , RI , SC , SD , TN , TX , VT , VA , WV , WI , DC

**Canada:** MB , NB , NS , ON , PE , QC

**Native Distribution:** E. Canada to FL, w. to e. Dakotas, w. NE, e. KS & n. TX

**USDA Native Status:** L48(N), CAN(N)



# ***Rudbeckia Triloba***

## **Brown-eyed Susan**

Foliage and Summer/Fall Flower



Picture Credit: Lady Bird Johnson Wildflower Center  
The University of Texas at Austin  
Photographer: Watkins, Mariann.

**Characteristics:** Herbaceous, Perennial

### **Appearance:**

**Height** – 2 - 5 ft.

**Flower Color** – Yellow

**Flowering Period** – June through October

**Light Requirement:** Sun, Part Shade

**Habitat (Community):** Open, moist woods

### **Hydrology:**

**Indicator status** – FACU Facultative Upland – Occurs on non-wetland, but found wetlands.

**Wildlife Benefits:** Food for birds, and provides nectar for butterflies.

**Distribution USA:** AL , AR , CO , CT , DE , FL , GA , IL , IN , IA , KS , KY , LA , MD , MA , MI , MN , MS , MO , NE , NJ , NY , NC , OH , OK , PA , SC , TN , TX , UT , VT , VA , WV , WI , DC

**Canada:** ON , QC

**Native Distribution:** NY to GA, s. to s. MN, w. IA, e. NE & OK; escaping northeastward

**USDA Native Status:** L48(N), CAN(I)

# *Heliopsis Helianthoides*

## False Sunflower

Foliage and Summer/Fall Flower



Picture Credit: Lady Bird Johnson Wildflower Center  
The University of Texas at Austin  
Photographer: Muller, Thomas.

**Characteristics:** Herbaceous, Perennial

### Appearance:

**Height** – 3 - 5 ft.

**Flower Color** – Yellow

**Flowering Period** – June through September

**Light Requirement:** Sun

**Habitat (Community):** Moist to dry; open woodlands; prairies; fields

### Hydrology:

**Indicator status** – UPL Upland

**Wildlife Benefits:** Attracts hummingbirds.

**Distribution USA:** AL , AR , CO , CT , DE , FL , GA , IL , IN , IA , KS , KY , LA , ME , MD , MA , MI , MN , MS , MO , NE , NH , NJ , NM , NY , NC , ND , OH , OK , PA , RI , SC , SD , TN , TX , VT , VA , WA , WV , WI , DC

**Canada:** MB , ON , QC , SK

**Native Distribution:** S. Que. to FL, w. to s.e. B.C. & NM; naturalized northeastward

**USDA Native Status:** L48(N), CAN(N)

# *Aster Novae Angliae*

## New England Aster

Foliage and Summer/Fall Flower



Picture Credit: Lady Bird Johnson Wildflower Center  
The University of Texas at Austin  
Photographer: Watkins Mariann

**Characteristics:** Herbaceous, Perennial

### **Appearance:**

**Height** – 3-6 ft.

**Flower Color** – Purple, and pink

**Flowering Period** – August, September and October

**Light Requirement:** Sun

**Habitat (Community):** Moist, open, wooded areas; meadows; mesic prairies;  
disturbed sites; stream banks

### **Hydrology:**

**Indicator status** – FACW Facultative – Occurs on wetlands or non-wetlands

**Wildlife Benefits:** Attracts bees and butterflies. Nectar source for Monarch  
Butterflies

**Distribution USA:** AL , AR , CO , CT , DE , GA , IL , IN , IA , KS , KY , ME , MD , MA ,  
MI , MN , MS , MO , MT , NE , NH , NJ , NM , NY , NC , ND , OH , OK , OR , PA , RI ,  
SC , SD , TN , UT , VT , VA , WA , WV , WI , WY , DC

**Canada:** BC , MB , NB , NS , ON , QC

**Native Distribution:** Que. & ME to SC, w. to e. Great Plains; also mts. of WY, CO &  
NM; naturalized elsewhere

**USDA Native Status:** L48 (N), CAN (N)



Date 10/21/10

Rain Garden Project for Stormwater Management and Non-point Source Pollution Mitigation Program

Troy Brook Watershed

Agreement between Rutgers Cooperative Extension and Property Owner

Rutgers Water Resources Program will install one (1) rain garden located at 14 Paris Place, Parsippany, Morris County, New Jersey. The installation will include a site investigation, design of the garden, one-call utilities check, a soil test, purchase of the plants and the soil amendments as necessary, purchase of the mulch for the original planting, excavation of the original garden, planting of the original garden, and development of a maintenance plan for the homeowner as a component of a stormwater management and non-point source pollution mitigation program.

I, the legal owner of the property located at 14 Paris Place, Parsippany, Morris County, New Jersey agree to the following in acceptance of the FREE rain garden. I will maintain the garden as outlined in the maintenance plan for a minimum period of three (3) years from the time of installation. During this time I will allow a Rutgers Cooperative Extension faculty or staff person to visit and inspect the rain garden when provided with 48 hours notice. The inspection may include the collection of water or soil samples. I will allow a sign (as per the attached) to be placed in the rain garden and I will allow photographs and other educational materials related to the design of my rain garden to be placed on the Rutgers website for educational purposes.

Rutgers Cooperative Extension Water Resources Program




Christopher C. Obropta, Ph.D., P.E.

Rutgers Cooperative Extension of Morris County, NJ



Pat Rector, Environmental and Natural Resource Management Agent

Property Owner

NAME: Dinesh CHHEDA



# Rain Garden

Water Quality and Habitat  
Enhancement Project



This garden is designed to intercept, treat, and infiltrate stormwater at the source, before it becomes runoff. The plants are native to the region and help retain contaminants that could otherwise harm nearby waterways.

Rain gardens are beautiful, low-maintenance, and inexpensive gardens that you can install at home.

<http://water.rutgers.edu>

**RUTGERS**  
New Jersey Agricultural  
Experiment Station



Ensuring the health of our nation's water quality  
**National**  
Water Program  
A Partnership of 2004 CSE20  
Rutgers State Colleges and Universities

**Sea Grant**  
New Jersey

# RUTGERS

New Jersey Agricultural  
Experiment Station



## Rain Garden Maintenance

Powerpoint provided by Rutgers Water Resources Program





Rain gardens are low maintenance gardens,  
not no maintenance gardens!

**REQUIRED:**

1. Inspecting
2. Watering
3. Mulching
4. Weeding
5. Pruning
6. Harvesting Plants
7. Fall Maintenance
8. Preparing a Photo Journal

**AS NECESSARY:**

1. Re-planting
2. Removing sediment
3. Mowing
4. Soil Testing
5. Cleaning of Gutters
6. Laying down stone and landscape fabric & pins

## Maintenance Measures: Required



### 1. Inspecting

- What am I inspecting for?
  - Weeds and invasive plants
  - Plant health
  - Excessive sediment
  - Movement of sediment within the rain garden



## Maintenance Measures: Required

### Inspection:

Inspect after rain for gardens that do not drain within 24-48 hours!!!!

This can lead to mosquito habitat.

Notify the Morris County Mosquito Commission if you notice Mosquito breeding at **973-285-6450**





## Maintenance Measures: Required



### 1. Inspecting

Observe the rain garden during rain events and note any **problems** or **successes**



*Walnut Avenue Elementary School, Union County*

**Problem: Gullying after rain event**

**Solution: Add a berm and/or plants**



*Hanson House/Hanson Park Conservancy, Union County*

**Success: Withstood rain event**

### 1. Inspecting

- Rain Garden Site Visit Worksheet (Post-Installation)



## Maintenance Measures: Required



### 1. Inspecting

- When am I inspecting?
  - Prior to growing season
  - End of growing season
  - After large storm events
  - During weather extremes





*Please submit annually for 3 years to*  
**Pat Rector, County Environmental and**  
**Resource Management Agent**  
**Rutgers Cooperative Extension**  
**Of Morris County**  
**P.O. Box 900**  
**Morristown, NJ. 07963-0900**

**Part I: The Basics**

Rain Garden Name	Dinesh Chheda Rain Garden
Rain Garden County	Morris County
Date	October 21-29, 2010 construction Today's Date: _____
Current Weather	
Did it rain yesterday? (please check)	<a href="http://www.wunderground.com/">http://www.wunderground.com/</a>
If yes, how many inches?	

Please include a photo of your rain garden if possible.

Site Contact Name	
Site Contact Phone number	
Site Contact E-mail Address	
In the past year, has there been a special event at or around the rain garden?	
How many people on average ask for more information about the rain garden after walking past the site?	
Has any rain garden visitor said that they intend to install a rain garden on their own property? If yes, how many visitors?	
Has any rain garden visitor said that they intend to install a rain garden at a school or other public building in their community? If yes, how many visitors?	
What maintenance has been performed so far, if any?	
Are there any difficulties with maintaining the rain garden?	
How does the rain garden handle large/intense storms? (Rain gardens should infiltrate stormwater within 24 hours)	
Do you have plans to install more rain gardens?	
Are there mosquitoes evident in the garden? Are there mosquito larvae present in the garden? Has the Mosquito Commission been notified as to the location of the Rain Garden (Yes Rutgers (Pat Rector has notified Tersa Duckworth of the Morris County Mosquito Commission).	
Are there any issues with overflow from the garden flowing to areas not intended?	

## Maintenance Measures: Required



### 2. Watering

*New rain gardens will need to be watered for the first one or two years until the garden is established!*

Soaker hose



## Maintenance Measures: Required



### 3. Mulching

- Apply mulch twice per year until groundcover establishes.





## Maintenance Measures: Required



### 4. Weeding

- Weeding more often will limit the amount of time you will have to spend weeding
- Watch for overly-competitive species
- Some weeds can be aggressively spreading underground by rhizomes



## Maintenance Measures: Required



### 4. Weeding

Be on the lookout for these invasive species in your rain garden:



Photo by Betty Ann Kelly

Wisteria



Photo by Betty Ann Kelly

Japanese Knotweed



Photos by Betty Ann Kelly



Wild Cucumber



Photos by Betty Ann Kelly



## Maintenance Measures: Required



### 5. Pruning

- Pruning directs growth of plants, improves health, and increases production of flowers and fruits.
- How does pruning a rain garden differ from my other gardens?
  - In a rain garden, dense shrub growth is encouraged to provide increased filtering capacity.



## Maintenance Measures: Required



### 5. Pruning

- “Deadheading” plants will also lead to succeeding new growths.
- Tattered and discolored plants should be cut back after spring arrives and growth is 4-6” tall.
- THINNING: basically, thinning out. This type of pruning removes entire braches back to the main trunk or major branches to the ground.
  - Expected result: large, open shrub
- HEADING: also known as heading back. This type of pruning removes only part of a branch.
  - Expected result: growth of multiple branches in place of single branch, thus a more dense shrub.





## Maintenance Measures: Required



### 6. Harvesting Plants

- Collect seeds and cuttings from successful plants in the rain garden and use them for the new season.
- Plant more of the successful species in the rain garden as necessary.



## **FALL MAINTENANCE**

### **7. Remove leaves, and any debris**

- Keep the *inflows, outflows, and ponding area* in your rain garden clear of any leaves and debris.
- Too much accumulation of leaves and debris can slow down percolation in the rain garden, and or overflow.
- Keep your *new gutters, and drain pipes* clear of any leaves, and/or debris as well.
- Too much accumulation of leaves and debris can create clogs, which will decrease infiltration and can also decrease the proper outflow during large storm events..





## Maintenance Measures: Required



### 8. Preparing a Photo Journal

Take photographs from the  
same location for consistency



*Fanwood Memorial Library,  
Union County*

## Maintenance Measures: As Necessary



### 1. Re-Planting

- After the first season, it may be obvious what plants were successful and what plants do not work for your rain garden.
  - Over the growing season, was the weather drastically different than the conditions the basin was designed to retain?
  - Was flow too fast through the basin, damaging health?
  - Is flow being incorrectly diverted from the rain garden?



Photo by Linda Brazaitis



## Maintenance Measures: As Necessary



### 1. Re-Planting

- Replace dead or diseased plant material
- Re-seed the berm if there are areas of exposed soil
- Replace rocks that may be diverting flow out of the garden
- Build up areas where more protection is needed



## Maintenance Measures: As Necessary



### 2. Removing Sediment

- Since the rain garden serves the purpose of catchment and filtering runoff, sediment will tend to accumulate within the garden.
- This is a sign of success – this sediment would have been directed straight to the local waterways without your efforts!



## Maintenance Measures: As Necessary



### 2. Removing Sediment

- With a flat shovel, remove soil that has accumulated in the basin. Avoid the vegetation!
- There is no exact schedule for when this should be done. Try to monitor sediment accumulation, especially after all heavy storm events.
- Be sure that sediment is not churning up from exposed areas of the rain garden. Flow should be dissipated to avoid these situations, which are likely to occur in the early stages of stabilization.
- Core aerate or cultivate bare areas annually if surface becomes clogged with fine sediments.





## Maintenance Measures: As Necessary



### 3. Mowing

- After the growing season, it will be necessary to remove stems and seedheads. These can be left for habitat and in some areas, aesthetics.
- A string trimmer can be used to maintain over-competitive growths.
- Dead plant materials can also be removed by a string trimmer or mower, if the mowing deck can be raised to cut at 6-8".





## Maintenance Measures: As Necessary



### 3. Mowing

- Mowing native grasses should occur two times a year in your rain garden.
  - Initial mowing can be done after the first few weeks of growth – early Spring.
  - Final mowing can be completed after ground nesting birds have hatched the next generation usually near mid-May



## Maintenance Measures: As Necessary



*Rain gardens can provide winter interest!*



## Maintenance Measures: As Necessary



### 4. Soil Testing

- Soil should be tested every 3 years.
- pH should be in an acidic range
  - If pH is <5.2, apply limestone
  - If pH is >7.0 to 8.0, add aluminum sulfate or sulfur to reduce pH according to recommendations.
- Soil amendments should only be added when no storms are expected.
- Refer to RCE Fact Sheet 797, download from:  
<http://njaes.rutgers.edu/pubs/>



## Maintenance Measures: As Necessary



### 5. Cleaning of Gutters

- Make sure rain gutters are clear of debris.
- If the flow of water is blocked in the gutter, the rain water will have difficulties getting to your rain garden.





## Maintenance Measures: As Necessary



### 6. Laying down stone and landscape fabric & pins



*Landscape fabric is secured with landscaping pins under stone to prevent weed growth.*

# Web Resources

- Blue thumb <http://www.bluethumb.org/plants/> This website will allow you to pick native plants based on raingarden, moisture (eg wet area upland area, bloom color etc) and then provide a list of plants that fit that criteria through a search.
- Rutgers Water Resources Program Rain Garden website: [http://www.water.rutgers.edu/Rain\\_Gardens/RGWebsite/raingardens.html](http://www.water.rutgers.edu/Rain_Gardens/RGWebsite/raingardens.html)
- Rutgers Fact Sheet [http://water.rutgers.edu/Rain\\_Gardens/fs513.pdf](http://water.rutgers.edu/Rain_Gardens/fs513.pdf)
- Native plants manual website [http://www.npsnj.org/rain\\_garden\\_home.htm](http://www.npsnj.org/rain_garden_home.htm)
- Native Plant society manual: [http://www.npsnj.org/references/NPSNJ%20Rain%20Garden%20Manual%20\(Pages%201-24\).pdf](http://www.npsnj.org/references/NPSNJ%20Rain%20Garden%20Manual%20(Pages%201-24).pdf) (includes example designs)
- Native Plant Society of NJ Manual Part 2: [http://www.npsnj.org/references/NPSNJ%20Rain%20Garden%20Manual%20\(Pages%2025-48\).pdf](http://www.npsnj.org/references/NPSNJ%20Rain%20Garden%20Manual%20(Pages%2025-48).pdf)
- University of Wisconsin Cooperative Extension how to manual: [http://water.rutgers.edu/Rain\\_Gardens/home.rgmanual.pdf](http://water.rutgers.edu/Rain_Gardens/home.rgmanual.pdf)
- Virginia Dept of Forestry Rain Garden Technical Manual: [http://www.dof.virginia.gov/mgt/resources/pub-Rain-Garden-Tech-Guide\\_2008-05.pdf](http://www.dof.virginia.gov/mgt/resources/pub-Rain-Garden-Tech-Guide_2008-05.pdf)
- University of Connecticut Extension Rain Gardens: <http://www.sustainability.uconn.edu/pdf/raingardenbroch.pdf>
- Landscape Plants rated by deer resistance. Perdomo, Nitzsche, and Drake. Rutgers Cooperative Research & Extension Bulletin E271 <http://njaes.rutgers.edu/pubs/publication.asp?pid=E271>

# Enjoy your Rain Garden



Parsippany-Troy Hills Rain Garden Summer 2010 Photo  
courtesy Pat Rector