



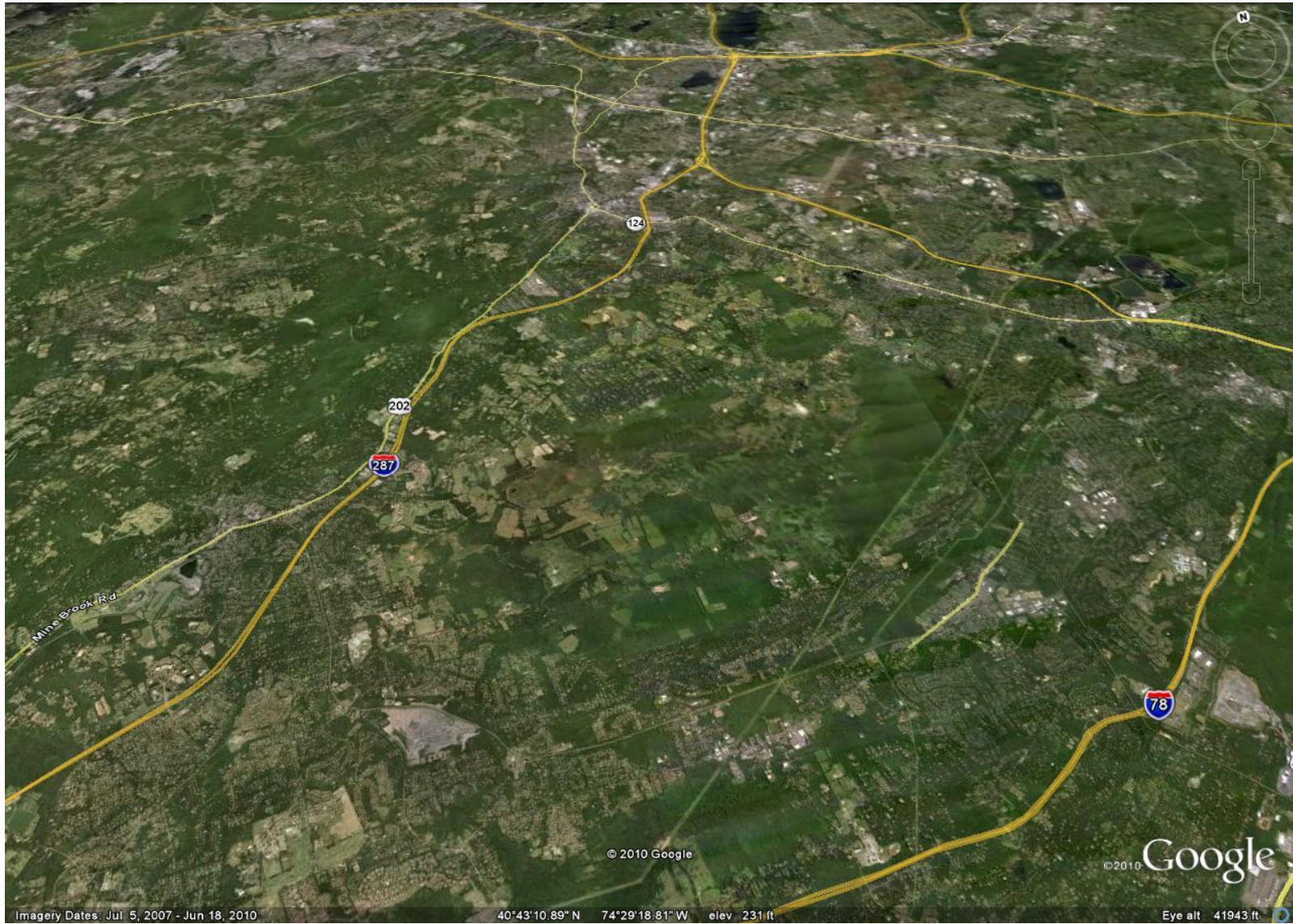
The Whys of Rain Gardens

A brief introduction

March, 2017

Hazel England

Great Swamp Watershed



Passaic Watershed from source to sea





Pervious vs Impervious surfaces

The combined roof drainage areas and driveway drainage areas make up the total impervious cover drainage area for your yard.





Impervious surfaces:

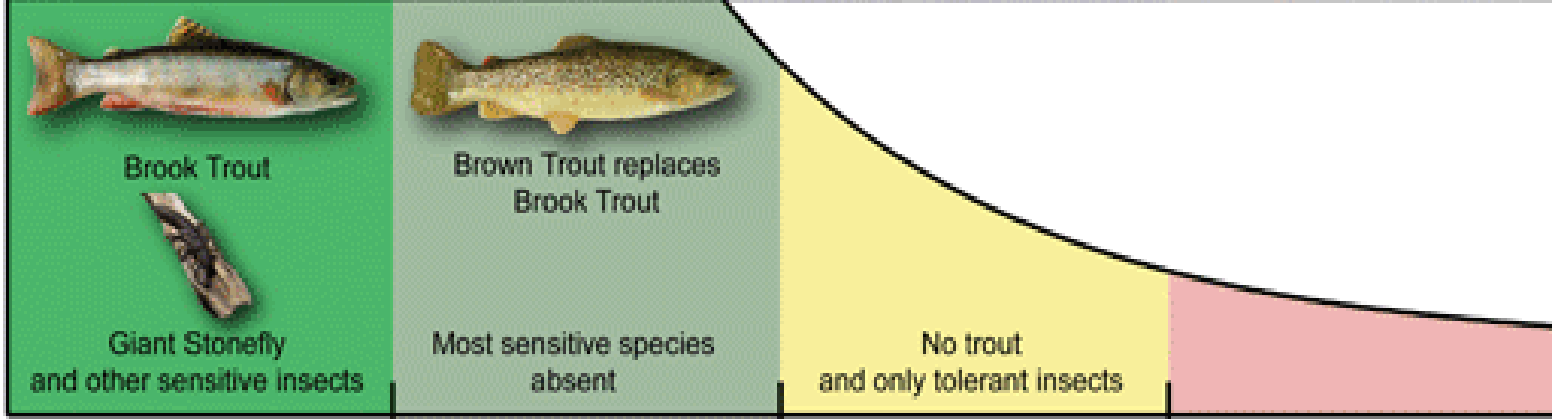
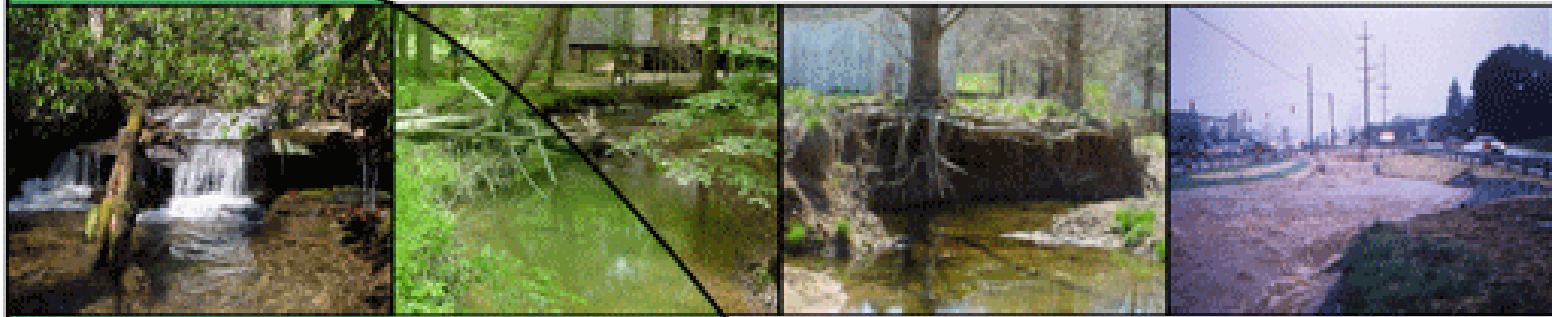
- Prevent groundwater infiltration
- Enable rapid stormwater runoff causing erosion and flooding
- Increase non point source pollution entering waterways







Stream Health



Percent Impervious Surface

<5%

- Water cool and clean
- Stream banks and bottom typically stable
- Trout can be found
- Endangered species can be found
- Many fish species
- Many salamander species
- Many freshwater mussels
- Many insect taxa

5-10%

- Water may be warmer and slightly polluted
- Erosion may be evident
- No brook trout
- Most rare and endangered species absent
- Many pollution tolerant fish
- Fewer salamander species
- Only tolerant mussels
- Fewer insect taxa

10-20%

- Water warmer
- Erosion usually obvious
- Trout absent
- Rare stream species absent
- Fewer fish species
- Only three tolerant salamander species
- No native mussels
- Mostly tolerant insects

>20%

- Water warm and pollution usually evident
- Unstable habitat
- Trout absent
- Non-native species dominate some streams
- Only tolerant fish species
- One salamander species
- No native mussels
- Only tolerant insects

What does rain
water run-off
pick up along
the way?









Green infrastructure:

- (Of which rain gardens are just one component)
- Helps reduce runoff,
- Recharges groundwater
- Controls erosion
- Gradually improves water quality
- Offers an opportunity to increase valuable native planting
- Offers watering-free landscaping in the yard

Mimic Natural Forest Systems





Mindset change

Rain water is an asset and not a waste product.

By infiltrating rain water into the ground we can significantly reduce the threat of flooding as well as pollution impacting streams, rivers, and lakes.

Enhance water quality by allowing water to be naturally filtered by soil instead of being piped, untreated into large bodies of water.

The Rain Garden Concept...



Rain gardens:

- Intercept, treat and infiltrate stormwater at source, to reduce runoff
- Removes non point source pollution
- Can create beneficial native habitat and can tie into existing landscape

Water quality benefits

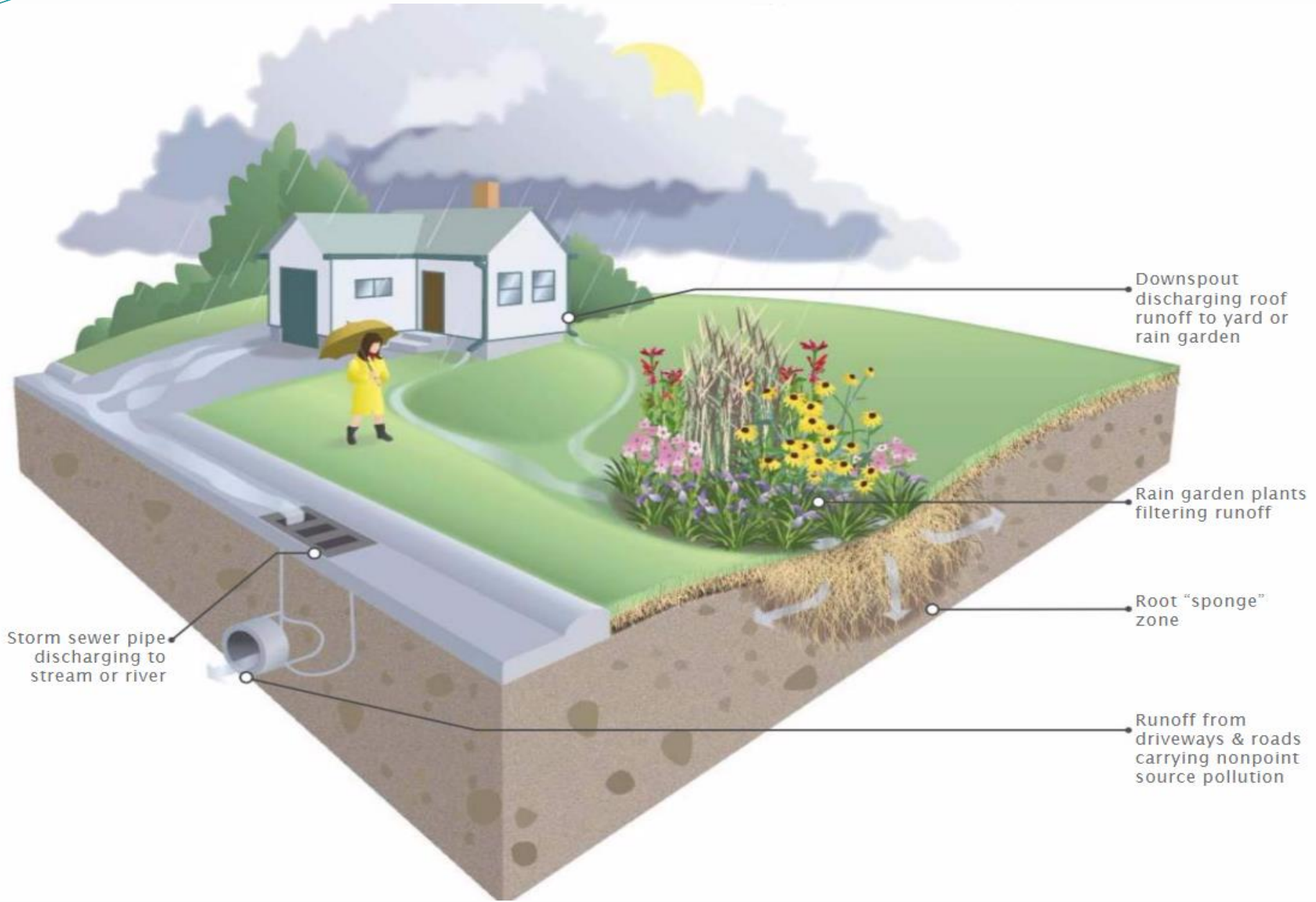
- **Soil particles:** Remove dissolved metals and phosphate
- **Plant uptake:** Removes small amounts of nutrients
- **Microbial Processes:** remove pathogens from water
- **Sedimentation:** removes suspended solids, debris, trash, phosphates and pathogens
- **Provides:** flood control, groundwater recharge and nutrient removal

How much water can a rain garden intercept?

Some Math.....

- 9/10 rainfall events are less than 1"
- NJ has around 44" of rain/yr
- Typical rain garden treats and recharges:
 $0.9 \times 44" = 40"/\text{year} = 3.3 \text{ ft/yr}$
- If rain garden receives runoff from
1,000' sq.ft.
- Total volume treated and recharged is
 $1,000 \text{ sq. ft.} \times 3.3 \text{ ft/year} = 3,300 \text{ Cubic ft/yr,}$
 $= \text{25,000 gallons per year!}$

Rain Garden concept

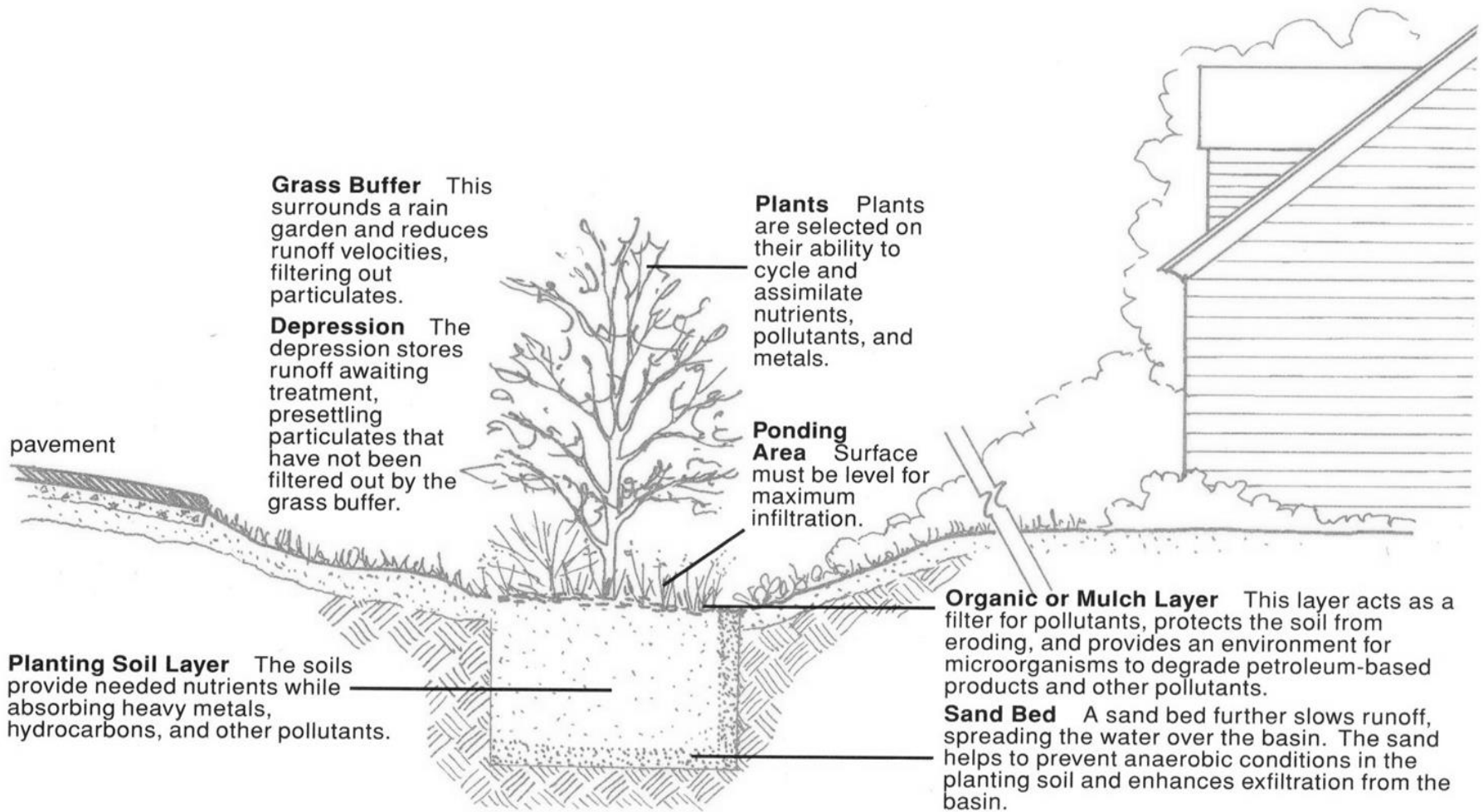


When is a garden a rain garden?

When it captures and infiltrates precipitation into the groundwater.

A rain garden is a shallow depression dug slightly below grade to catch runoff and slowly allow recharge into the ground.

Main parts of a rain garden



Parts of the Rain Garden Process

1. Plan it
2. Install it
3. Maintain it

Plan it

Investigate your
property.



Plan it

Rain gardens should ideally be located between the source of runoff (roofs & driveways) and the runoff destination (drains, streams, low spots).



Plan it

1. Identify drainage area run off that will be captured
2. Look for current drainage issues such as ponding
3. Consider current landscaping practices
4. Look at current flow direction in heavy storms
5. Measure impervious surfaces

continued

Plan it: Calculate roof line runoff



Plan it

6. Determine location of buried lines
7. Conduct a percolation test
8. Know your soil type- conduct a soil test
9. Figure the approximate soil amendment materials needed
10. Choose correct native plants and numbers
11. Design the plant layout

Plan it: Conduct a percolation Test



1. Dig a hole 12" deep by 6" diameter.
2. Fill hole with water and let stand until all the water has drained into the ground.
3. Refill the empty hole with water again. Measure the depth of water with a ruler.
4. Check the depth of water with a ruler every hour for 4 hours.
5. Calculate how many inches of water drained per hour.

~1" of water draining /hour is a good site

Plan it

Q. How big does a rain garden have to be?

10' x 10' - 15' x 20'

is typical.

Plan It

House is 60' x 40' .

Roof area is 2400 sq'

Downspout collects 25% of
roof,

Downspout drainage area is
equal to 600 square feet.

Plan it

Rain Garden Sizing Table

Based on New Jersey's Water Quality Design Storm

Drainage Area	Size of 3" Deep Rain Garden (Clay soils)	Size of 6" Deep Rain Garden (loamy soils)	Size of 8" Deep Rain Garden (sandy soils)
500 ft ²	200 ft ²	100 ft ²	75 ft ²
750 ft ²	300 ft ²	150 ft ²	112 ft ²
1000 ft ²	400 ft ²	200 ft ²	149 ft ²
1500 ft ²	600 ft ²	300 ft ²	224 ft ²
2000 ft ²	800 ft ²	400 ft ²	299 ft ²

Plan it

- Rain garden should be at least 10' from the house so infiltrating water doesn't seep into foundations.
- Do not place the rain garden directly over a septic system.
- Do not put rain garden in places where the water already ponds or the lawn is always wet.
- Avoid large tree root zones.
- A flat portion of the yard will be easier to dig.
- Place in full or partial sunlight as a preferred option to maximize plant choice

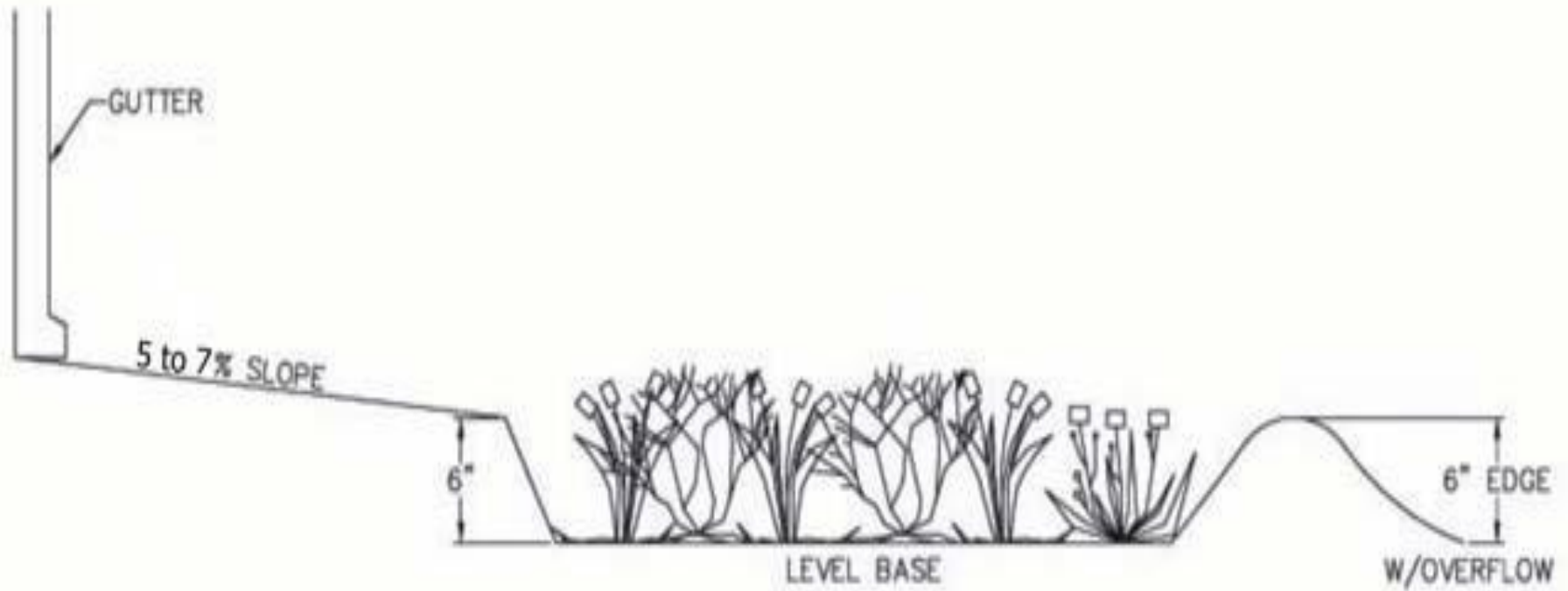
Plan it

- Rain garden should be a level bed to allow rainfall to spread out over entire site.
- Create a lip or berm to allow rain water to infiltrate, but have a overflow for heavy storms.

Plan it

- A typical rain garden is 4-8" deep.
- Deeper and you have a shallow pond.
- Shallower and you need a huge area to infiltrate a roof-line's worth of runoff.

Plan it

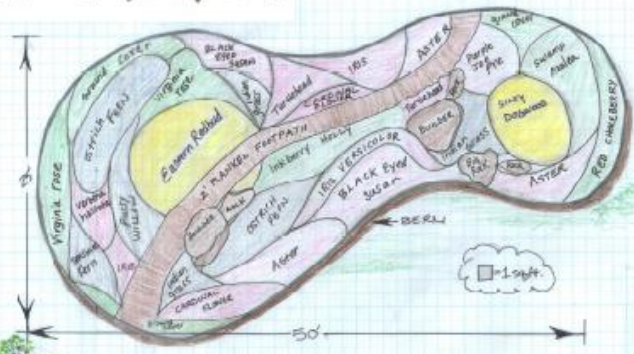
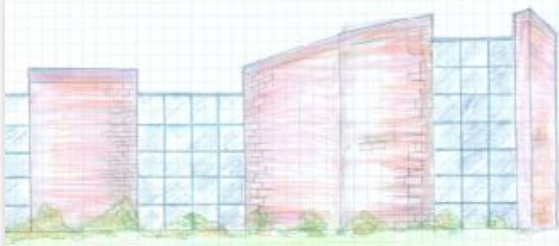


Plan it



Plan it

A Rain Garden



Key

- Woody Deciduous
- Evergreen Shrub
- Flowering Perennial
- Ornamental Grass / Fern

The Site...

... of the proposed garden is a 50' x 25' swath of sloping land just off the parking lot behind the Ag Building. A notch will be cut in the curb to allow storm water runoff to be received by the new Rain Garden.

the NATIVE plants

- Swamp aster: *Rhododendron viscaria*, medium height, deciduous shrub of forested wetlands and seasonal marsh edges. Ornamental, frequent white flowers. 1-4' DBL.
- Virginia creeper: *Rosa virginiana*, low to medium size shrub. Flowers are in the high solitary. Flowed covered on dry sites. 4-6' FACV.
- Pump willow: *Salix discolor*, a large native shrub with fuzzy flowers yellow in the spring before leaves emerge. Usually found growing in damp thickets or along stream banks. 20-40' FACV.
- Inland green: *Amelanchier alnifolia*, a striking herring gull, very tolerant of most site conditions. To 8' DBL.

- Eastern Redbud: *Cercis canadensis*, small tree with heart-shaped leaves. Flowering tree pointed tip. Magnolia flowers are not showy in Early spring. To 30' occasional taller. FACV.
- Red Chokeberry: *Amelanchier canadensis*, shrub with densely hairy lower leaf surfaces. Found in forested wetlands and shrub logs. White to pink flowers on hairy stalks develop into red fruits. 5-10' FACV.
- Milk Dogwood: *Cornus Amomium*, medium size shrub of forested wetlands, stream banks and moist woods. Young twigs are reddish to purple. White flowers and dark blue berries. 8-30' FACV.
- Aster: *Aster flexuosus*, attractive shrub with lavender, purple or blue flowers. Semiarid shade and drought tolerant. 3-5' FACV.
- Turtlehead: *Chelone glabra*, ornamental wetland plant with light terminal clusters of white tubular, two-lobed flowers resembling turtle heads. 2-8' DBL.
- Purple Joe Pye: *Eupatorium purpureum*, mid-height of moist woods and pond shores. Three shaped clusters of purple flowers. 4-6' FACV.
- Hickberry Holly: *Ilex glabra*, mid-sized evergreen shrub. Pines resistant but can tolerate dry. 4-8' FACV.
- Blue Yewert: *Yucca filamentosa*, a medium height bush with opposite whorled and bluish to steel bluish flower spikes. To 4' FACV.
- Oxeye Daisy: *Margarita struthifera*, large tropical looking wildflowers of damp shady woods and lawns. To 5' FACV.

- Yucca: *Yucca filamentosa*, native to northern wetlands with attractive blue flowers and sword shaped leaves. 2-5' DBL.
- Cardinal flower: *Lobelia cardinalis*, pretty bush of wetlands with striking bright red flowers and knotted, alternate leaves. To 3' FACV.
- Sensitive fern: *Osmunda cinnamomea*, elegant fern, normally about 2' tall from wet meadows and forested wetlands. To 8' FACV.
- Black eyed susan: *Rudbeckia hirta*, drought tolerant perennial of fields and meadows. Bright yellow flowers, prolific bloomers. To 2' FACV.

Design and Renderings By:
Kim Corbo Nuccio
2007

Plan it

Rain gardens have 3 distinct planting zones:

- Berm/lip or upland area
- The Depression
- Ponding area.

Each zone will stay wet for a different amount of time and plants need to match the wetness zone.

Plan it



Plan it



Assemble the
dig team!

Install it: Remove the existing grass



Install it: Excavate to desired elevation



Install it: grade and shape



Install it: Add soil amendments



Install it: Amend the soil



Install it: amendments improve percolation and infiltration rates



Install it: Create a berm



Install it: Getting water where it needs to go



Install it: Prepare an overflow



Ready to plant





Install it: planting





• **Native plants** have deep penetrating root systems.

• They penetrate and break up soils into lower water recharge layers.

• Deep roots and tolerance for drought mean they are well adapted to the vagaries of NJ climate.

Additional benefit of good plant choice

- Winter Interest
 - Fall Color
- Sun/Shade tolerance
 - Nectar Source
- Screening for privacy
- interest through the year
 - Low maintenance
- Wildlife beneficial species

Choosing the Right Plants for rain gardens:

- Assess the site conditions:
soil and sun/shade
- Select plants that thrive in those conditions
- Match final size & shape to site
- Avoid invasive plants

Lowest Zone/Ponding Area Native Plants



Middle Zone/Depression Area Native Plants





Highest Zone/Upland Area Native Plants







Red and Yellow Twig Dogwoods in the winter









Maintain it

Maintain it: Short Term maintenance

- Mulch with top dressing undyed cedar mulch
- Water plants until established-soaker hose can help water efficiently
- Remove unwanted weeds- little and often
- Fertilize at planting, and check after 3 years
- Inspect during and after rain events for issues

Maintain it: Long Term maintenance

- Troubleshoot problems- if erosion occurs, build up berm, plant more grasses or add more mulch.
- Prune, thin and cut back shrubs to encourage multiple stem growth
- Remove excess sediment, trash or debris as it collects

Maintain it: Troubleshoot problems

Slowing down the speed of water as it enters the garden:

(1) Attach a perforated plastic diffuser to the end of your gutter/ downspout.

(2) Use river rock at the entrance point of the rain garden.

(3) Site your rain garden within a 10 – 15 foot grass buffer between the garden and the gutter/downspout. Use native grasses and let them grow tall.

Resources and Thanks

- Thanks to Rutgers University Water Resources Page for use of their Rain garden educational materials, which were used in the creation of this presentation.
- Rutgers University Cooperative Extension has many useful articles, homeowner guides and rain garden design and installation information:
- <http://water.rutgers.edu/Projects/Projects.htm>

Resources



http://www.npsnj.org/rain_garden_home.htm