Rain Gardens in Home Landscapes

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Colleges of Agricultural and Environmental Sciences & Family and Consumer Sciences

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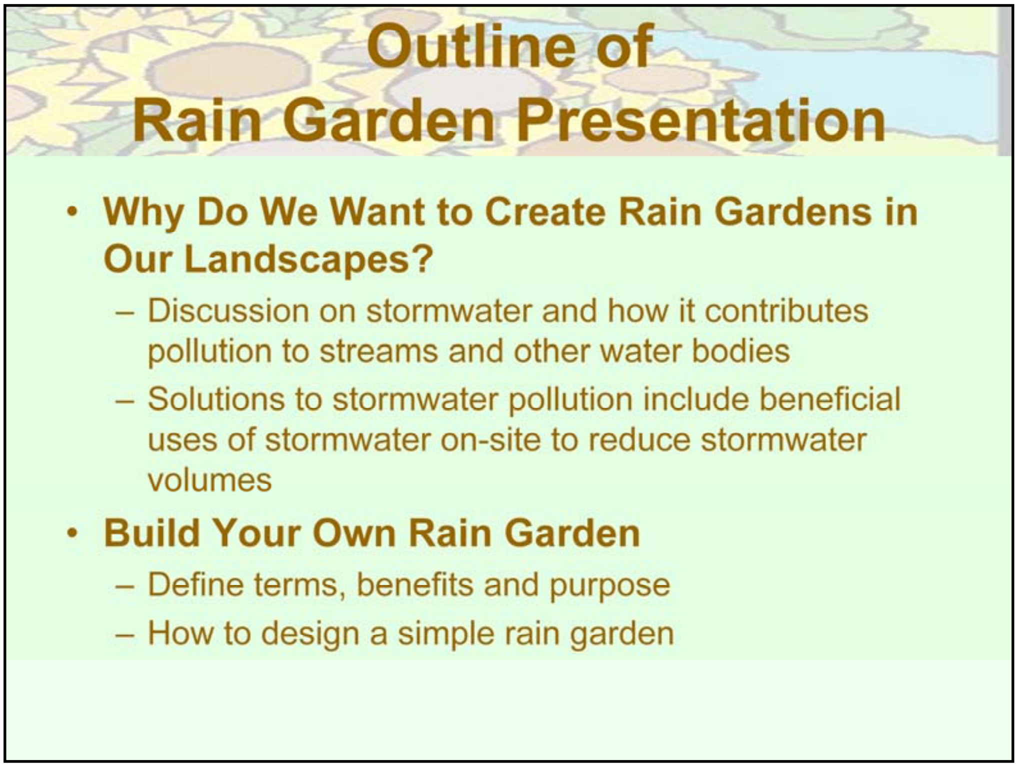
References at the end of the presentation



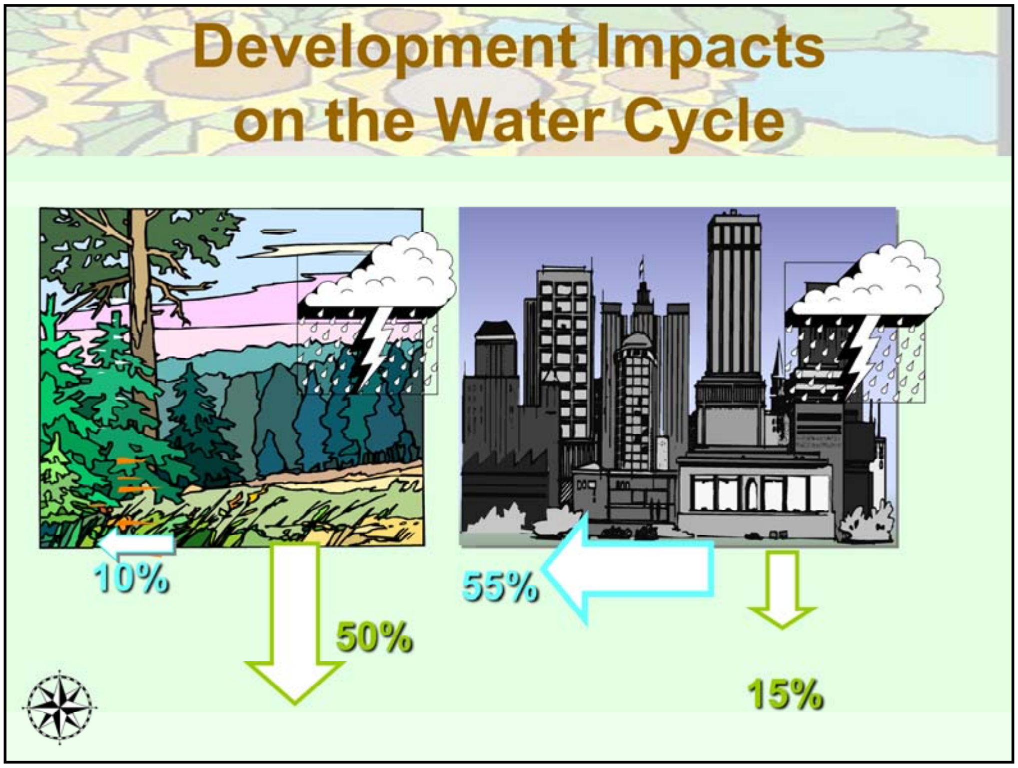
This PowerPoint presentation can be used as one long presentation or two or three shorter presentations.

The first part of the presentation that may be used independently includes Slides 3-15 and discusses stormwater as a pollution source for streams and water bodies. It provides a background on why rain gardens in our landscapes have great environmental value.

The second part of the presentation includes Slides 16-39 and 60-63. It gives a thorough definition of what rain gardens are and what purpose they serve. It then gives step-by-step instructions on how to design a rain garden for a specific site.

Another section that can be broken out into one short presentation would include Slides 40-59. Add a new title slide called “Typical Plants for Rain Gardens in Georgia.” This section of slides discusses appropriate plants to use in rain gardens.

This is the title for the first part of this presentation. This section discusses how stormwater contributes pollution to streams and other water bodies and solutions to stormwater. The emphasis on solutions will be on the value of on-site infiltration of runoff to reduce stormwater volumes.



This slide shows undeveloped land in the left diagram and urban development in the right diagram with the typical percentages of runoff and infiltration. Evapotranspiration would make up the other 30-40 percent of the rainfall in the two diagrams, but the emphasis here is on the changes to runoff from stormwater and infiltration.

In an undisturbed environment, water falls to the ground, either hitting the surface and running off or percolating through the soil into the groundwater. Through both routes, water makes its way to our streams, ponds, wetlands, rivers, lakes and oceans.

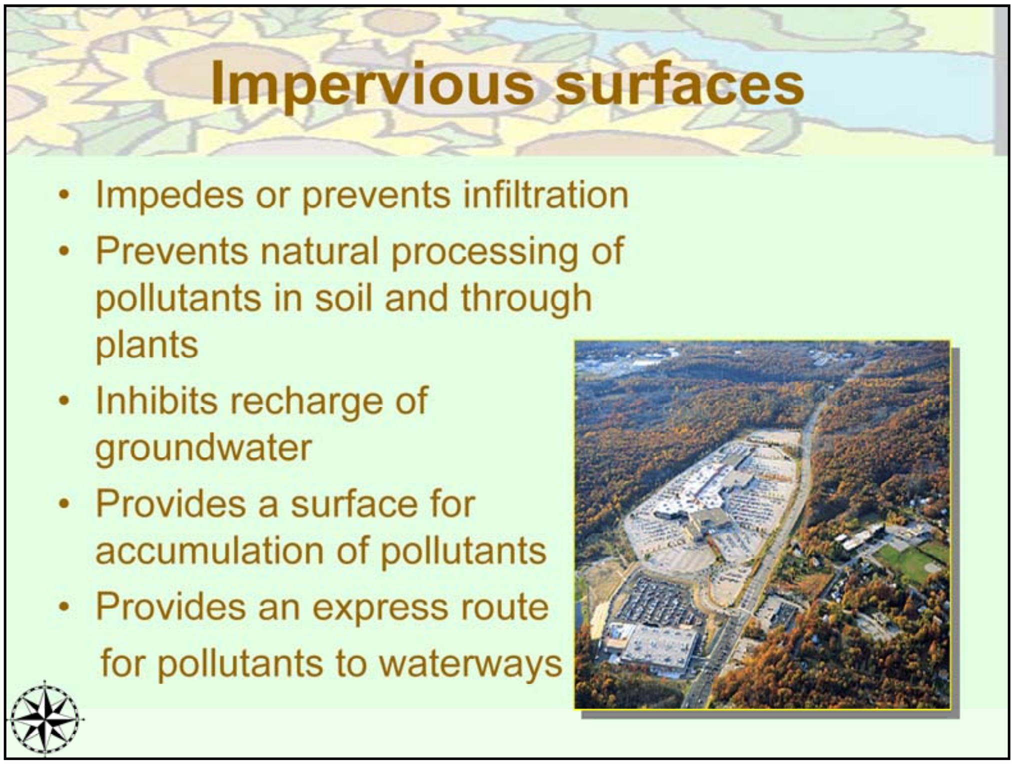
As we develop and alter the landscape, this natural cycle is disturbed, impacting both water quantity AND water quality. The diagram shows that runoff or stormwater increases from 10 to 55 percent of rainfall in an urban environment while the amount of rainfall that infiltrates into the soil to recharge groundwater decreases from 50 to15 percent.

The changes to the hydrology or water cycle from changes caused by land development are:

•Increased runoff

- more frequent flooding
- more severe flooding

•Decreased infiltration



Impervious surfaces are the primary cause of the radical change in the water movement patterns with development and urbanization. Impervious surfaces cover the soil and prevent water from infiltrating. In an undisturbed situation, the soil removes pollutants from infiltrated rainfall and some of the infiltrated water is used by plants. Both soil and plants purify water that is infiltrated. Without infiltration of rainfall, groundwater does not get recharged. Without a groundwater recharge, the base flows of streams are lowered during hot, dry periods.

Without infiltration the amount of runoff volume is greatly increased. The runoff builds up faster and moves over impervious surfaces faster than in natural conditions. The impervious surfaces are places where pollutants accumulate when it is not raining. Once rain begins, the pollutants are quickly and easily picked up from the impervious surfaces as the rainfall runs off. As the runoff accumulates, so do the pollutants at first. Typically impervious surfaces are all interconnected to carry stormwater away quickly to natural streams and water bodies. However, this means that pollutants in the runoff are also carried off rapidly into our streams and water bodies. The impervious surfaces become an express route for pollutants of all kinds.

The increased volume of runoff from storms also increases the likelihood of flooding downstream, particularly during intense storms.

This picture shows oily water running into a storm drain. Without proper stormwater management, this polluted oily stormwater could go untreated into local streams, lakes or ponds.

“Non-point source pollution,” or polluted runoff, is created when water washes over the land and picks up all sorts of diffuse pollutants along the way, whether it is oil from our cars, fertilizers from our lawns and parks, or garbage carelessly tossed on the ground. Non-point pollution sources must be reduced and eliminated differently from pollutants that come from one specific source such as treatment plant effluent or industrially produced pollutants. With a specific source of pollution, the pollutants should be removed as a part of the process taking place at the source before the waste water is allowed into a natural water body. However, non-point source pollution has many sources coming together, and so it requires a different strategy and the involvement of more than one source to prevent this pollution from reaching our streams and water bodies.

EPA has recently declared stormwater pollution to be the #1 water quality problem in the United States.

The Major Pollutants transported to streams in Urban Stormwater.

There are a variety of pollutants that can get into our waters. Many officials know about sediment because of the guidance and regulation on sediment and erosion control already received. It is important to know that sediment is just one of several non-point pollutants, and what we do to control sediment and erosion does not necessarily control other pollutants.

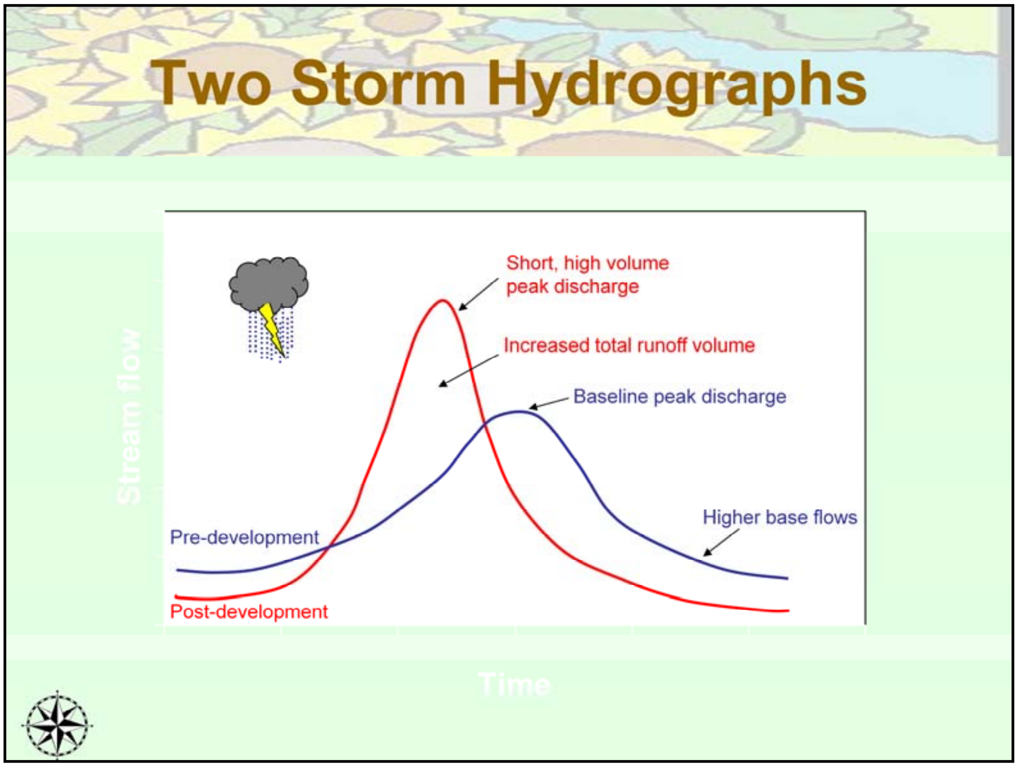
Typical nutrients in stormwater runoff are nitrogen and phosphorus, which may come from fertilizers, animal waste and leaks from septic systems or sewer lines.

Pathogens come from animal waste, both domestic and wild animal wastes, and from failed septic systems or leaking sewer lines.

Toxic contaminants include hydrocarbons, such as fuels and lubricants from cars, and metals that wash off streets and parking lots.

Debris is any kind of litter. Organic materials, such as yard waste and leaves, washed into streams can reduce the oxygen content of waters by feeding microbial activity in the water. Other litter leaches toxins and metals as it degrades and breaks down in the water.

Thermal stress is considered a pollutant because warmer water holds less



Two Storm Hydrographs.

While stormwater carries pollutants into natural waterways, the increase in stormwater volume changes the dynamics of water flow in local streams. The graph here shows typical changes that impervious surfaces cause in the flow of streams.

The storm hydrographs that you see here show what a person would see if they stood at a spot by a stream and watched the stream flow rise and fall during a local storm event. To the left, the hydrograph starts before the stormwater reaches the stream. As a storm occurs, the water in the stream rises, as can be seen in the two storm hydrographs here. Then when a storm stops, the stream water level and flow will gradually fall back down to the original stream level before the storm.

The two lines in this graph show how impervious surfaces change the flow regime in streams nearby. The blue hydrograph is for a stream that is in an area with no development, such as undisturbed woodlands. The red hydrograph is for the same stream after development; the amount of impervious surfaces has increased upstream in the watershed. You can see from the difference in the hydrograph shapes the major impacts that increased stormwater volume from impervious surfaces cause:

•Increased peak volume of stormwater

•Increased total volume of stormwater

•Peak flow comes faster and with more energy

•Low flow rates are reduced

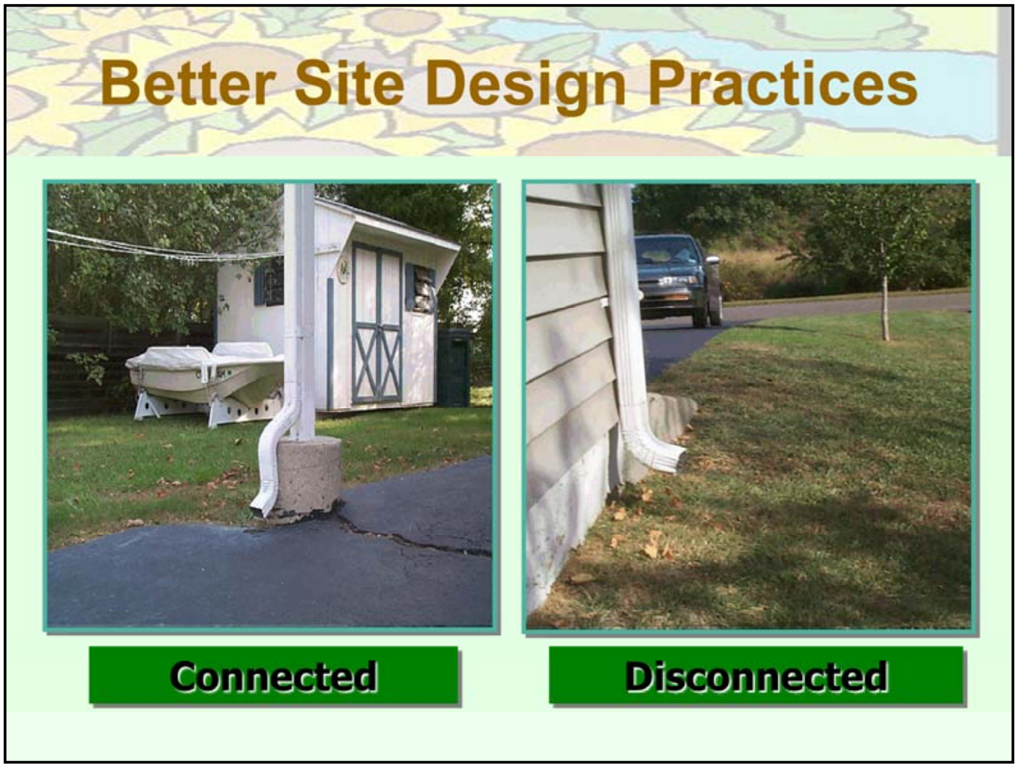
Traditional Drainage Systems.

The traditional methods of dealing with stormwater can be summarized in three words: collect, concentrate, convey. This approach achieves the primary goal of preventing flooding locally from increased stormwater. Until recently (the past 10-20 years), flooding was the only consideration for managing stormwater. However, during the past 20 years, there has been a change in the goals of managing stormwater to include treatment of pollutants and reduction of increased peak stream flows and stormwater flow volumes into streams.

Traditionally, to reduce peak flows and high flow rates, detention ponds were used. While some detention basin designs reduce suspended solids such as sediment, metal dust and other trash in stormwater, other detention designs provide almost no treatment for pollutants. More current design standards are requiring that detention basins provide a certain amount of pollutant treatment as part of their design.

Often they do not create the kind of hydrologic improvements in streams that was intended. Research has shown that when there are several detention ponds along the length of a waterway, the design specifications for the individual detention ponds result in a higher peak flow and total volume flow downstream where all of the ponds have a combined influence. While design methods are changing today to better deal with this reality, older pond designs can make downstream conditions worse than before the pond was in place. Thus, flooding can increase directly downstream of a highly developed area.

The reality is that a detention pond cannot create the same hydrologic results as infiltration does on a site. An alternative to having all stormwater rapidly routed into a detention pond is to create landscape conditions that allow for more infiltration.



Better Site Design Practices.

To improve water quality as well as reduce stormwater volumes, a new approach to managing stormwater focuses on better site design. Better site design principles include:

- Reducing connections between impervious surfaces
- Reducing the concentration of stormwater
- Allowing for more stormwater to infiltrate on site

Better site design reduces the amount of stormwater that has to be managed downstream and off-site. These pictures show the simple changes that can be made for better site design such as downspouts spilling into a green space such as turfgrass (picture on the right) rather than spilling onto another impervious surface like the driveway in the picture on the left.

The picture on the left, where the parking lot spaces and islands are impervious and are directly connected to the storm drain, is a situation that embodies the traditional collect, concentrate and convey paradigm.

The picture on the right has an asphalt walkway that slopes down from its center so that stormwater collecting on the walkway flows into the turfgrass on either side of it to be filtered by the turfgrass and infiltrated into the soil. A storm drain is not needed for minimal slopes in this picture.

Better site design also relies on keeping as much stormwater as possible on-site without causing flooding to allow it to be infiltrated into the soil. Stormwater retained and dealt with on-site requires fewer regional detention facilities for good regional stormwater management.

Better site design for stormwater management requires that we have more green spaces to:

- Promote infiltration of stormwater
- Decrease runoff from highly impervious sites
- Provide buffers between natural waterways and polluted impervious areas
- Filter pollutants before they reach natural waterways

The picture to the left shows two rain gardens in the midst of intensive impervious spaces. The two rectangles in the center of the picture are actually rain gardens. The picture on the right shows that all kinds of plants, from turfgrass to willow trees, create aesthetically pleasing landscapes and can potentially reduce water quality impacts from stormwater.

Importance of Infiltration

- Preserves natural hydrology
  - Reduces runoff and flooding
  - Maintains base flows
- Cleans water, removing pollutants
- Inexpensive water quality control

The more we can enhance infiltration of stormwater on-site, the less costly the total stormwater management bill can be. Infiltration is an inexpensive way to reduce runoff and flooding, maintain base flows in streams, and remove pollutants through the filtering provided by soils, mulches and plants. Rain gardens provide infiltration on-site while also creating a beautiful green component of the landscape.

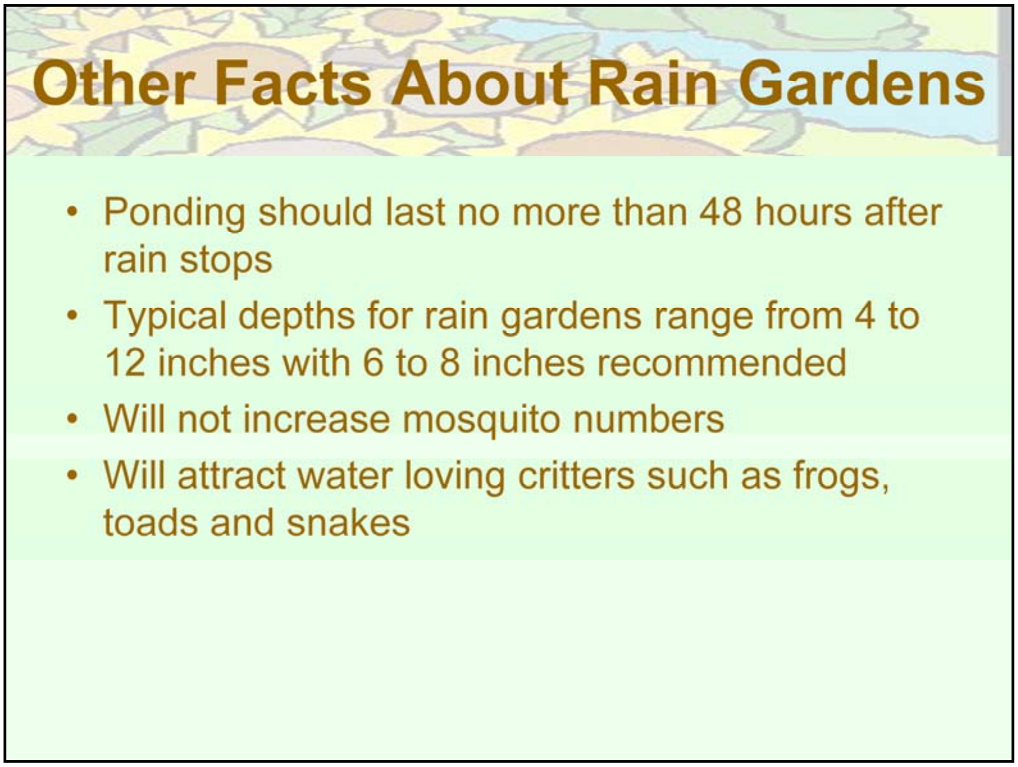
This slide is the transition from the first part of this presentation about stormwater and its impacts in urban places to the second part of the presentation. This part of the presentation will discuss the procedure and considerations for a homeowner to design a rain garden for their own landscape.

The definition of a rain garden is given in the slide. The highlighted words of the first bullet emphasize the fundamental things that make a rain garden different from other landscape design features.

- The rain garden is man-made and is designed to deal with a particular amount of stormwater.
- A rain garden captures only a shallow amount of water. It is not like a pond or water garden.
- The shallow amount of water does not persist for a long time like a wetland or bog garden.
- The rain garden is a sunken or bowl-shaped area that captures stormwater.
- The soil, mulch and plants of the rain garden provide filtering and treatment of the water to remove pollutants and utilize some of the water for the plants.
- The rain garden should be attractive and fit seamlessly and naturally into the surrounding landscape and site.

The primary purposes of the rain garden in a landscape are:

- •Capturing stormwater runoff from impervious surfaces on-site
- •Reducing the amount of runoff leaving the site



Other Facts About Rain Garden.

Other characteristics of a well-designed rain garden are:

- The ponding of water should last no more than 48 hours after rain stops
- Typical depths for rain gardens range from 4-12 inches with 6-8 inches recommended

Rain gardens also:

- Should not increase the number of mosquitos
- Will attract water-loving creatures such as frogs, toads and snakes

Properly designed rain gardens will be low maintenance, low water use and attractive landscape features. Perennials plants are planted in rain gardens. Annual plants cannot handle the extremes of wetness and dryness that are going to occur. The stormwater that is infiltrated into the rain garden provides most of the water needed for the plants. Only in long, dry periods or during the first year or two of establishment should plants in a rain garden need additional water.

Compared to a flat graded area of turfgrass, the concave shape of the rain garden will increase the amount of water infiltrated. Some studies have shown an increase in infiltration with rain gardens of about 30 percent.

Because the rain garden captures some stormwater on-site, it reduces the runoff leaving the site, thus reducing the risk of flooding and streambed destruction downstream of the site.

Rain gardens create a different kind of feature or habitat in the landscape if desired. Plants can be chosen that will turn a rain garden into a butterfly garden, or the rain garden can be designed to provide lots of food for birds in the winter, by the mix of plants and the location that is chosen.

Planning Your Rain Garden

- Location
- Size
- Plant Mix

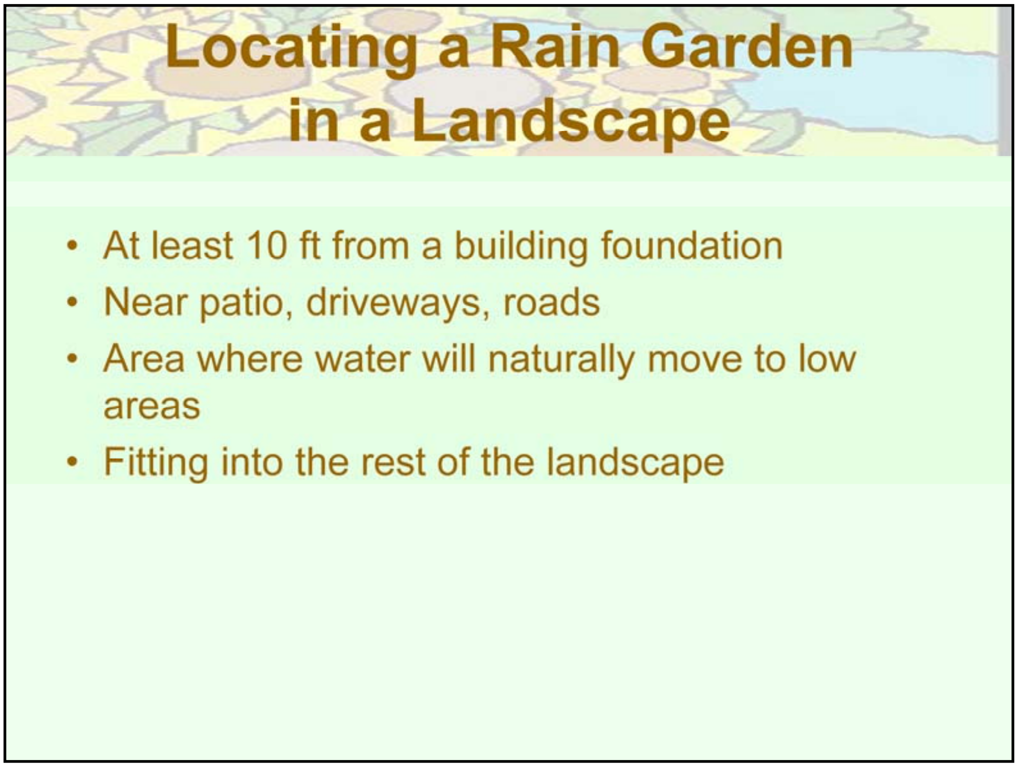
Planning Your Rain Garden.

When a homeowner is ready to create a rain garden, three critical issues need to be settled before installation:

•The location should be chosen

•The size of the rain garden needs to be decided

•The kind of plants to be used in the rain garden are chosen



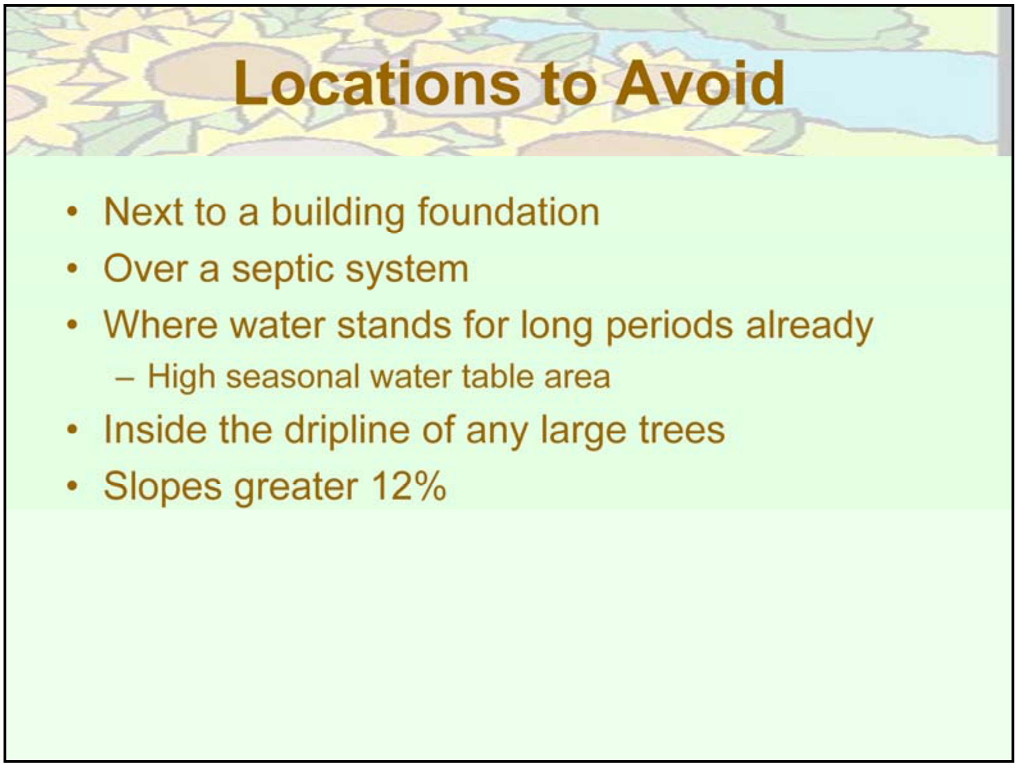
Locating the Rain Garden in a Landscape.

Rain gardens should not be placed against a building foundation because the infiltrated water is not good for the foundation.

However, a rain garden can be placed next to impervious surfaces like driveways and patios to capture the runoff from these areas.

Considerations on where to place a rain garden depend on the topography of the land and how the rain garden will fit into the rest of the landscape.

The location of the rain garden must be downstream of where the runoff begins, so placing rain gardens in lower areas that water will naturally move to often will work.



Locations to Avoid for Rain Gardens.

A rain garden should not be installed on top of a septic tank. The septic tank should not have standing water over it in the event that it needs to be serviced.

The septic drainage field has enough water to contend with from the septic system and should not have the burden of additional infiltrated water from a rain garden, so keep rain gardens farther than 50 feet upstream or 10 feet downstream of the septic system drainage field.

If there is a seasonally high water table in the landscape, a rain garden should not be located over that area. If water stands for long periods after rain has ceased and/or where wetland type plants are evident, the area is likely to have the water table too high during some significant part of the year.

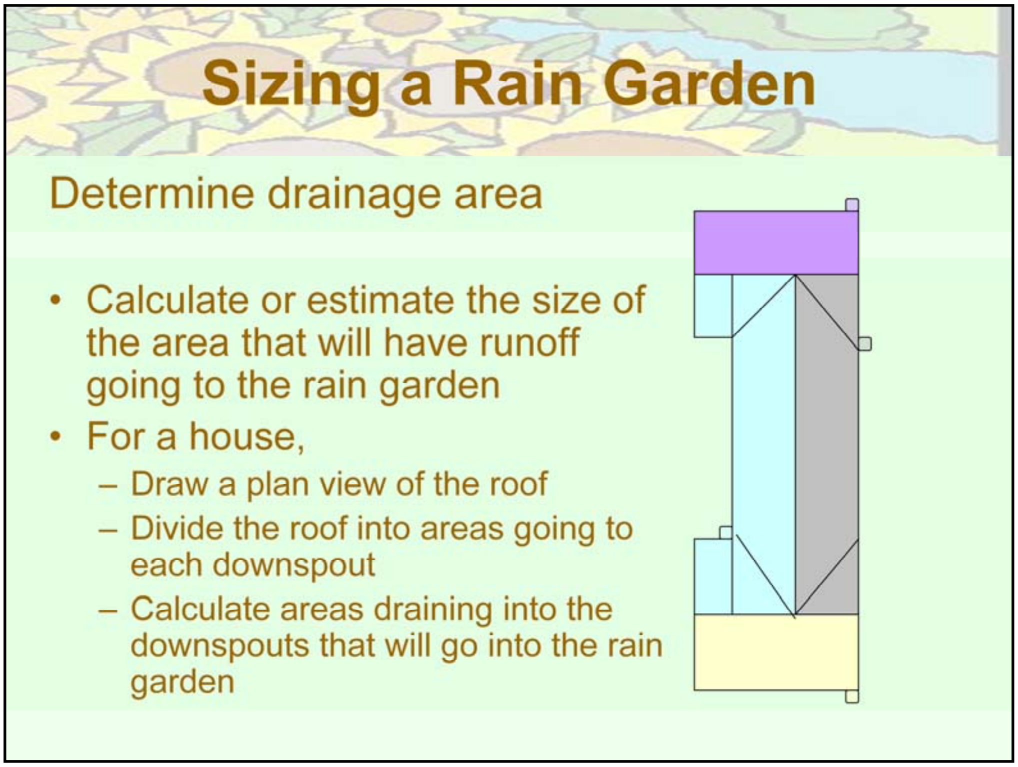
Placing a rain garden within the dripline of a large tree is damaging to the tree as well as a lot harder to dig and prepare. Avoid this.

For areas with slopes greater than 12 percent, hire professional help to create a rain garden as this sloping land will require special erosion control materials during establishment of the rain garden plants.

Rain Garden Size.

Once the location for the rain garden is established, the next step is to determine what size the rain garden should be. The sizing of the rain garden depends on four things–area of drainage, depth of ponding, soil, and slope of location.

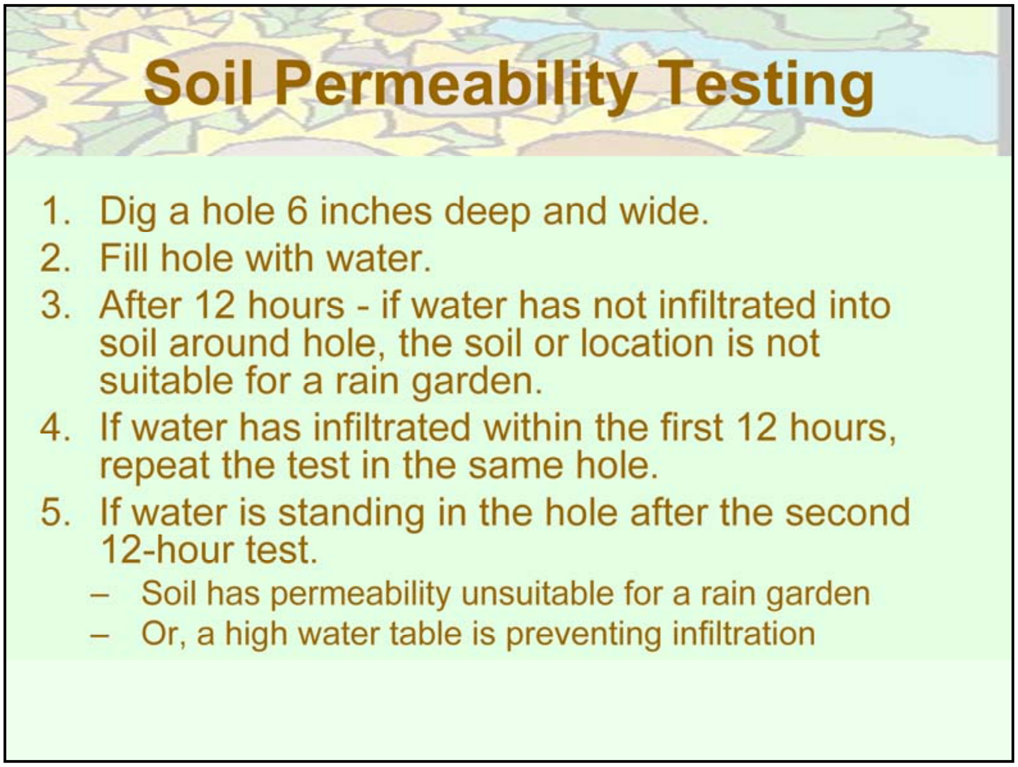
A rain garden's depth should be 4-12 inches with the 12-inch depth being an extreme that is suitable for special high infiltrating soils. Most rain gardens will have a depth of 6-8 inches. For soils with really low permeabilities, a depth of 4-6 inches may be more appropriate and the rain garden needs to be larger in area.



Sizing a Rain Garden.

The first factor in sizing the rain garden is the size of the drainage area that runoff will be coming from. Often the rain garden will only capture runoff from some of the downspouts coming off the roof of a house. To determine the area going to the rain garden, the roof must be divided into the areas that drain to each downspout. Then the areas draining to the downspouts that will be directed to the rain garden need to be determined. The areas can be calculated by measuring on the ground the distances between roof edges and roof ridges and length of the side.

The example in the diagram shows a roof with four downspouts. Each different color of the roof represents an area going to one of the downspouts. The angles of the roof make no difference in the area drained. The area being measured is the “bird’s eye view” area or the footprint of the structure that the roof area covers.

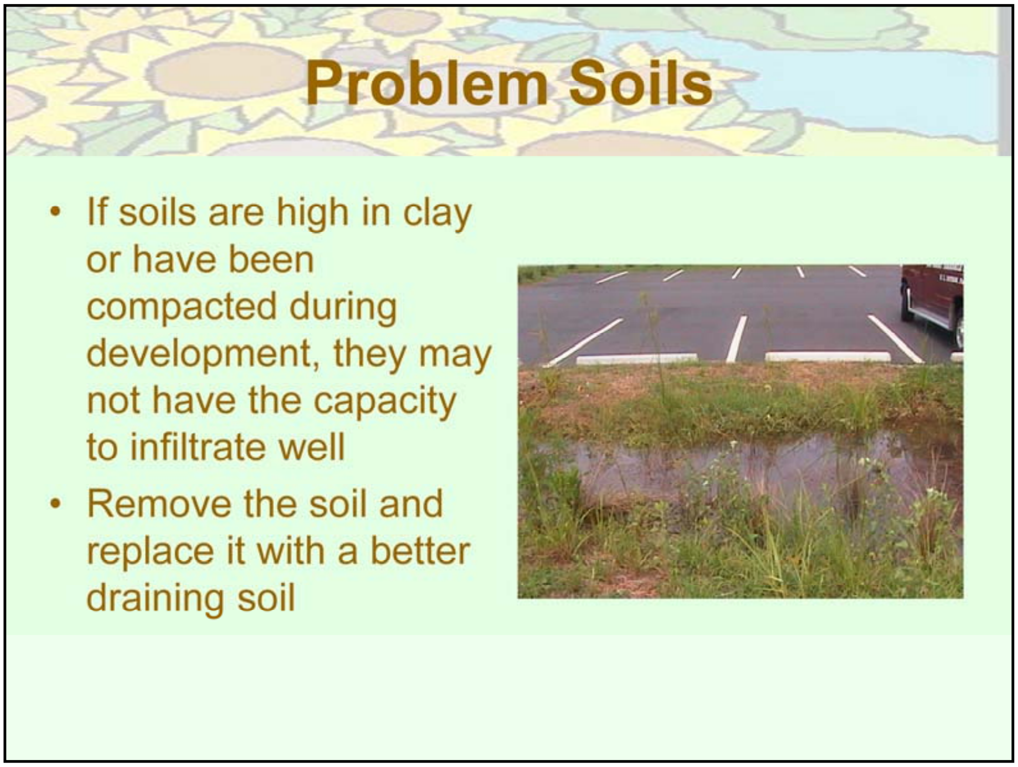


Soil Permeability Testing.

Once you know the drainage area, you need to determine the infiltration ability of the soil.

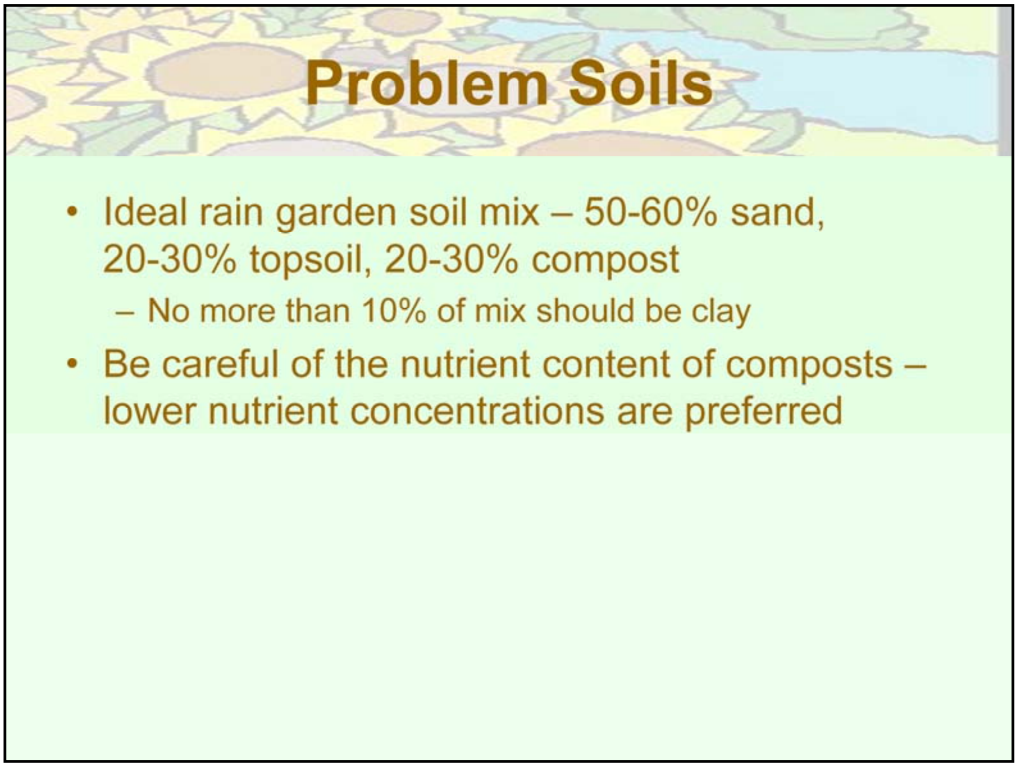
Test the soil for its permeability. A 6-inch depth of water should infiltrate into the soil in 12 hours or less to be able to use the native soils in the rain garden. A 12-hour infiltration test can be carried out twice to make sure that the soil will infiltrate fast enough for the rain garden after it has gotten wet.

While it is difficult to watch the hole for the 12 hours, checking back periodically during the test to get an estimate of how long it takes for the water to infiltrate will provide better information as to how to size the rain garden. If the water infiltrates rapidly into the soil, the size of the rain garden can be smaller. For slower infiltration of the water, the rain garden size will need to be larger.

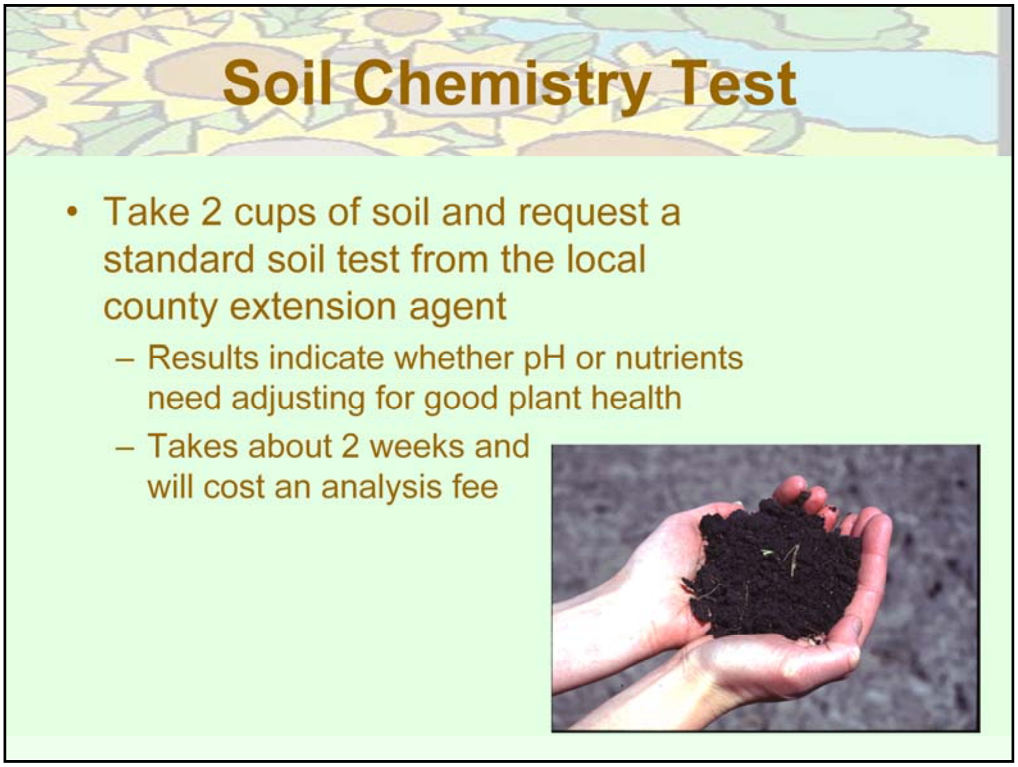


Problem Soils.

For soils that do not have suitable permeability, a rain garden can still be created. The native soil will need to be excavated and a more permeable soil mix placed into the area beneath the rain garden.

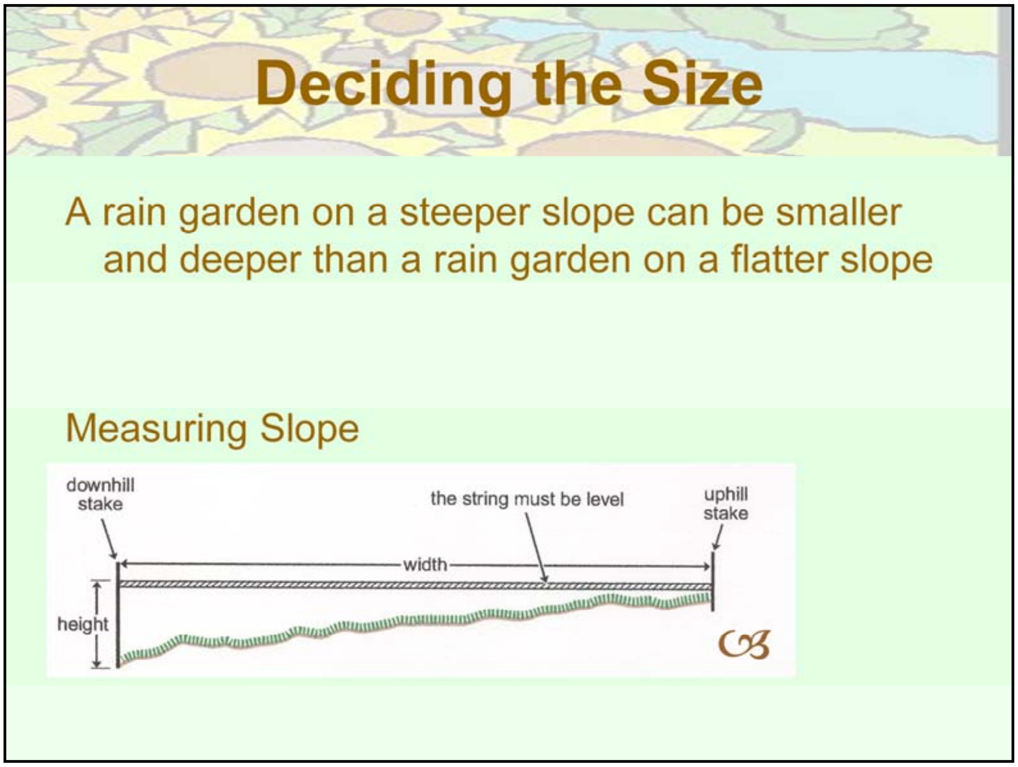


A rain garden soil mix should be 3-4 feet deep below the surface of the rain garden. The compost used in the rain garden mix should be mature, well-composted materials, not just any kind of fresh organic matter. More mature composts will have lower nutrient content and will release the nutrients slowly. Uncomposted manures are likely to be too high in either nitrogen or phosphorus to be suitable for a rain garden soil mix.



Soil Chemistry Test.

While the soil is being tested for infiltration, a chemical analysis should be carried out to determine the pH and nutrient content of the soil to make sure that plants can be established well in the soil.

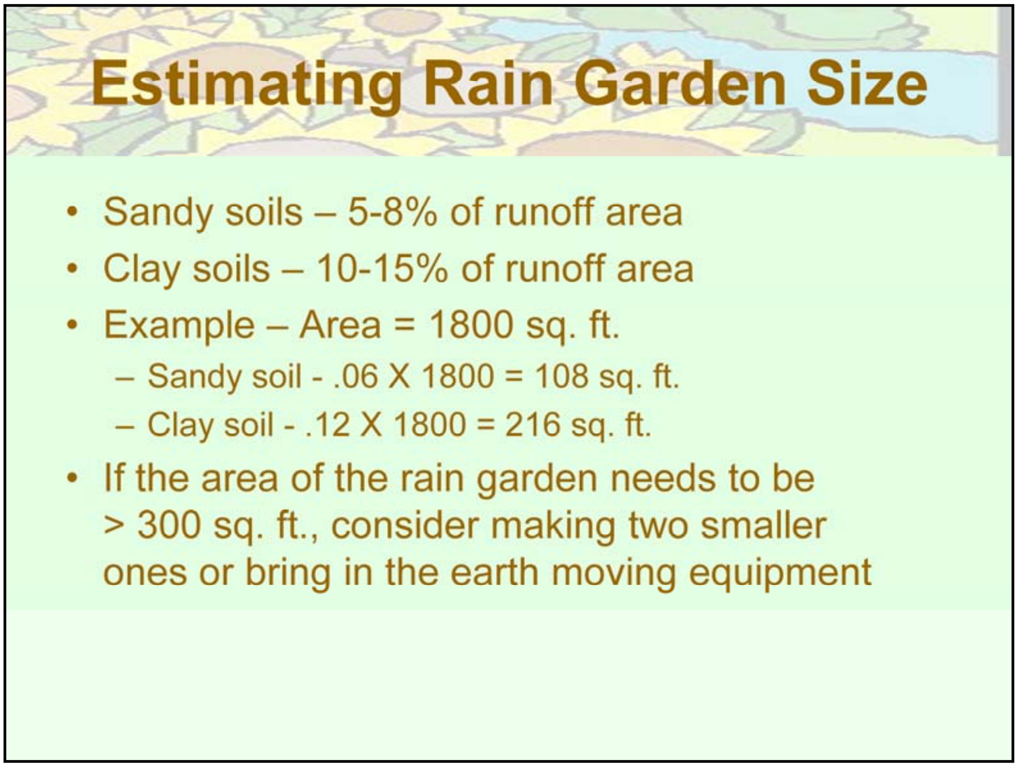


Deciding Size.

The steeper the slope of the land in the location of a rain garden, the deeper the rain garden should be. For flatter sloped areas (less than four percent slope), the rain garden can be 4-6 inches deep. For slopes between 5 and 7 percent, the rain garden can be 6-7 inches deep. For 8-12 percent slopes, the rain garden should be 8 inches deep.

To get an estimate of the slope of the land will require two stakes, a string and a level. Place the two stakes in the ground at a good distance apart along the slope. Tie the string to the uphill stake at the ground level. Then bring the other end of the string down to cross the downhill stake. Use the level to establish the string in a level position and, in this position, mark the spot where the string crosses the downhill stake. Measure from the ground to the mark on the stake and the distance between the two stakes. With these two measurements in the same units, i.e. inches, divide the height by the width. You should get a number less than one, which is the slope in a fractional form. Multiply that number by 100 to get the percent slope.

For example, 100 ft. width between stakes and 12 inches height on the downhill stake gives a 1 percent slope 12/(100 X 12) = .01 => .01 X100 = 1%

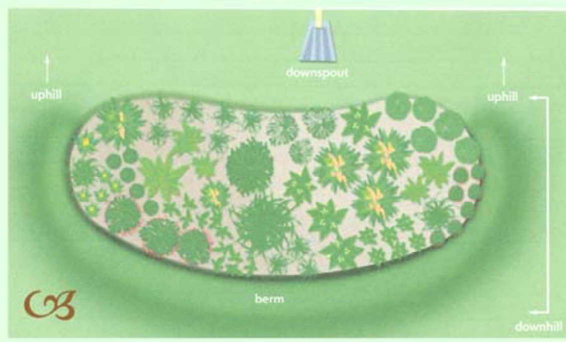


Because sandier soils will have higher infiltration rates, rain gardens can be smaller for the same drainage area than soils with lower infiltration rates. If the soil permeability test had all the water infiltrated in 6 hours or less, then the drainage area can be calculated by 0.05-0.08 to get the size estimate for the rain garden. For soils that took longer than 6 hours for all of the water to infiltrate in the permeability test, the rain garden area should be 10-15 percent of the drainage area it will be capturing.

For hand digging a rain garden with shovels, it is recommended that a rain garden be no larger than 300 sq. ft. If calculations indicate that a larger rain garden is needed, then consider making two smaller ones or bring in earth moving equipment.

Rain Garden Shape

- Rain gardens are usually not square or a perfect circle
- The long length should be perpendicular to the major slope
- The shorter length should go down the major slope



•Rain gardens are usually not square or a perfect circle

•The long length should be perpendicular to the major slope

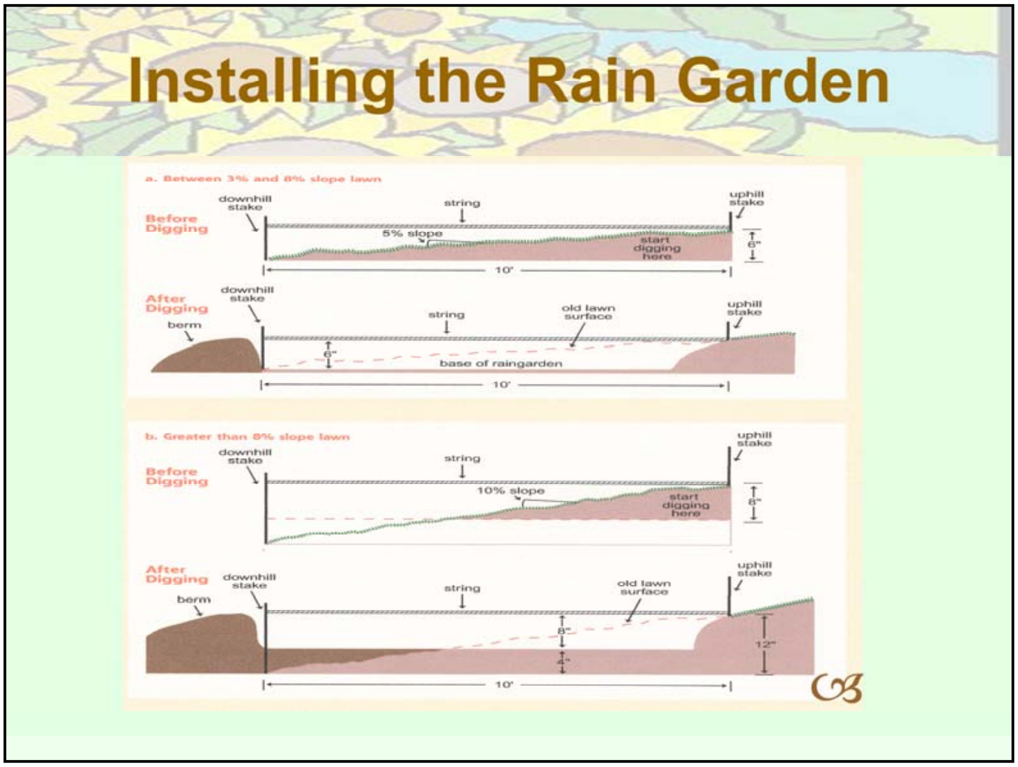
•The shorter length should go down the major slope

By making the longer width of the rain garden perpendicular to the major slope, the berm height needed is kept to a minimum and the bermed edge will flow more naturally into the uphill edge.

Layout of the Rain Garden.

It is necessary to plan for the rain garden to have some overflows with large storm events. This means that, as the rain garden is being planned and designed, you must consider where the overflow should be located. It should not be located such that it will cause a stream of water to flow onto your neighbors property.

Most of the time, it is best to have the overflow take the same route that it would have taken before the rain garden was there. For example, if a downspout previously went onto a driveway and flowed into the street, it would be appropriate to have the rain garden collecting water from that downspout to have its overflow directed onto the driveway.



This slide gives a side cut view of the re-shaping of two slopes to create a rain garden. The top two profiles are before and after creating a rain garden on a shallower slope. The bottom two profiles are before and after creating a rain garden on a steeper slope.

Notice that the bottom of the rain garden should be level.

The top of the downhill berm should be approximately the same height as the uphill edge of the rain garden.

Installing a Rain Garden.

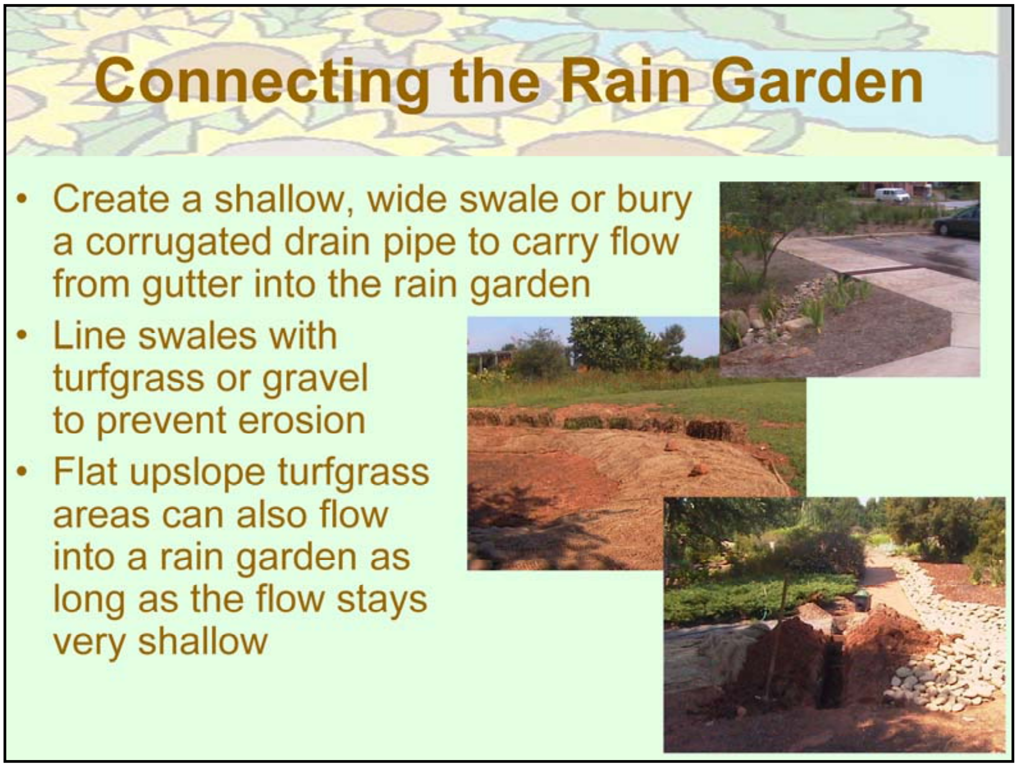
Here you see a bird's eye view of a typical rain garden. The blue arrow indicates the overflow path for this rain garden. In this case, the berm is lower in elevation where the blue arrow is located to allow stormwater from larger events to flow out of this overflow area in a controlled way.

Overflow Area

- Always have an overflow method for larger storms
  - Lower area in the berm somewhere
  - Drain pipe within rain garden

The picture on the left shows a low swale that crosses the berm at the bottom of a rain garden to allow excess stormwater to flow out.

The picture on the right shows an overflow standpipe that will carry excess stormwater away from the rain garden when it has reached its capacity.



Connecting the Rain Garden.

Since rain gardens should not be up against houses or buildings, it is important to consider how the drainage area will be connected to the rain garden. Above are three typical ways of connecting impervious areas to the rain garden. The top method uses a grate and pipe fixture across a sidewalk. The second picture has a grass filter strip at the top of the rain garden where water flows in by sheet flow through the turfgrass above it. The bottom picture shows a rock-covered swale or dry creek bed created to carry water into a rain garden.

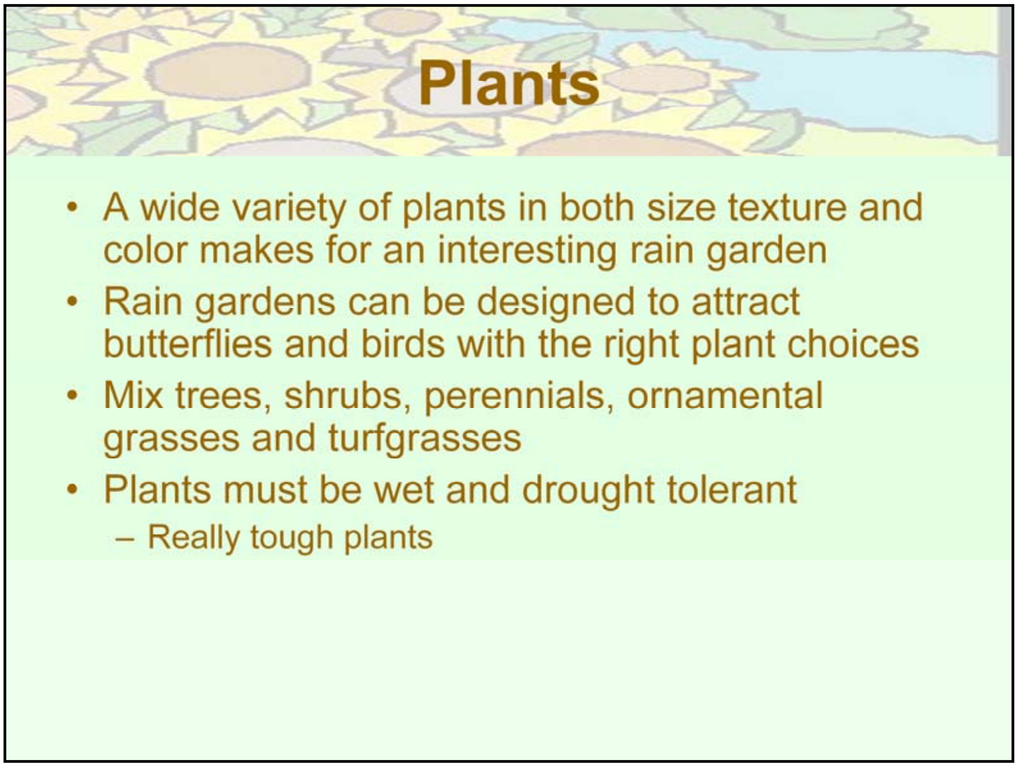
Installing a Rain Garden

- Lay out edge of rain garden with rope or garden hose
- Set aside the top 4 to 6 inches of soil (topsoil), excavate the hole, then use topsoil to backfill the planting area.
- Move the soil in the rain garden area down to the bottom edge of the rain garden

Once the location, size, and layout are planned, the rain garden can be installed. Use a rope, a garden hose or outdoor marking paint to outline the area that is going to be the rain garden. Remove the top 4-6 inches of topsoil from the rain garden area, then excavate the rain garden area to the depth desired minus the 4-6 inches of topsoil. For the excavation, the soil in the middle of the rain garden is moved to the downhill side of the rain garden to form the outer berm. The inside of the rain garden is made flat and the soil is loosened in preparation for returning the topsoil to undo any compaction of the subsoil.

Installing a Rain Garden.

The topsoil is returned to the excavated rain garden bottom. Lime is added if recommended by the soil test. Then 2-4 inches of compost should be spread over the rain garden bottom and mixed into the topsoil. Now the rain garden is ready to be planted.



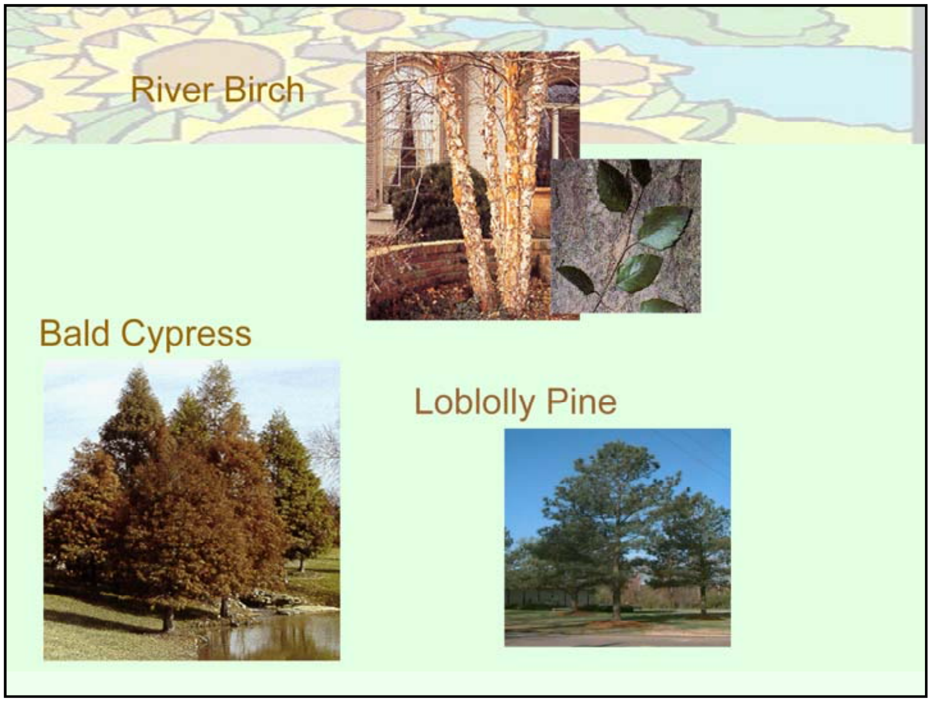
A wide variety of plants in both size texture and color makes for an interesting rain garden.

Rain gardens can be designed to attract butterflies and birds with the right plant choices.

Mix trees, shrubs, perennials, ornamental grasses and turfgrass.

Plants must be wet and drought tolerant.

This slide gives a list of trees suitable for rain gardens in Georgia. These trees are all drought tolerant and not easily damaged by periodic wet conditions. You will notice that most of the trees are deciduous. Most pine trees and other conifers do not do well with overly wet conditions. However, there are always exceptions and the loblolly pine is the exception in Georgia. Of course, cypress trees can handle wet and dry conditions as well. This list does not have every tree species or cultivar that will thrive in a rain garden situation, but these are some common choices that many people are familiar with.



These tree choices are native trees that will fair well in a rain garden.

The Bald Cypress (*Taxodium distichum*)

•Large, 70-90 ft. tall and 50-60 ft. wide in the urban environment when mature

•Pyramidal form

•Deciduous with ferny thin soft-textured leafing

•Fall color is dark rusty

The Loblolly Pine Trees (*Pinus taeda*)

•Large pine species

•50-100 ft. tall

The River Birch (*Betula nigra*)

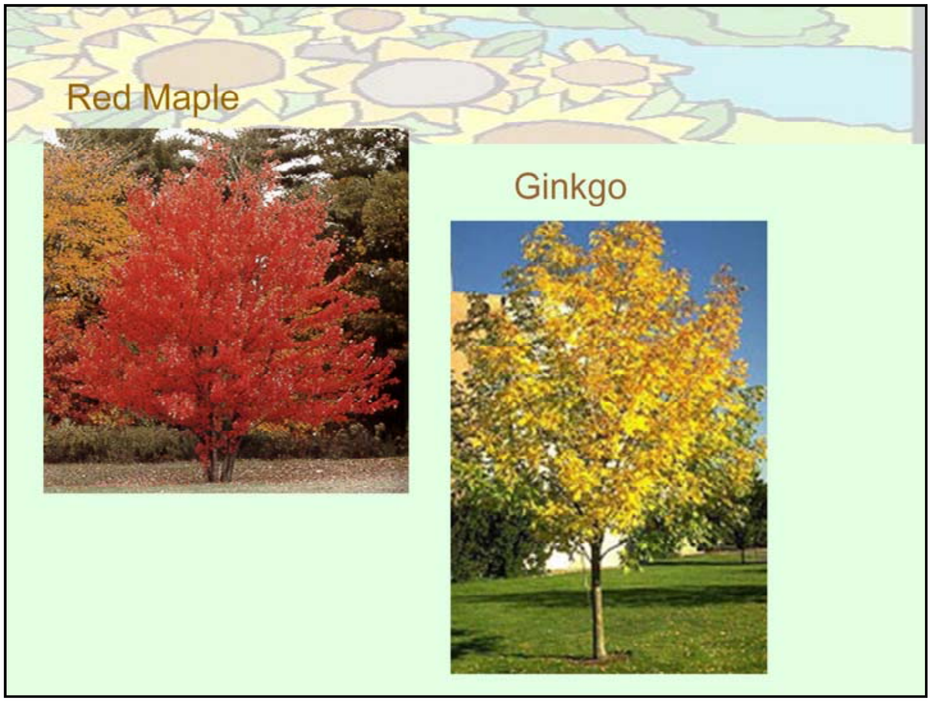
•Beautiful bark

•Yellow to chartreuse fall color

•Deciduous

•Height 30-40 ft.

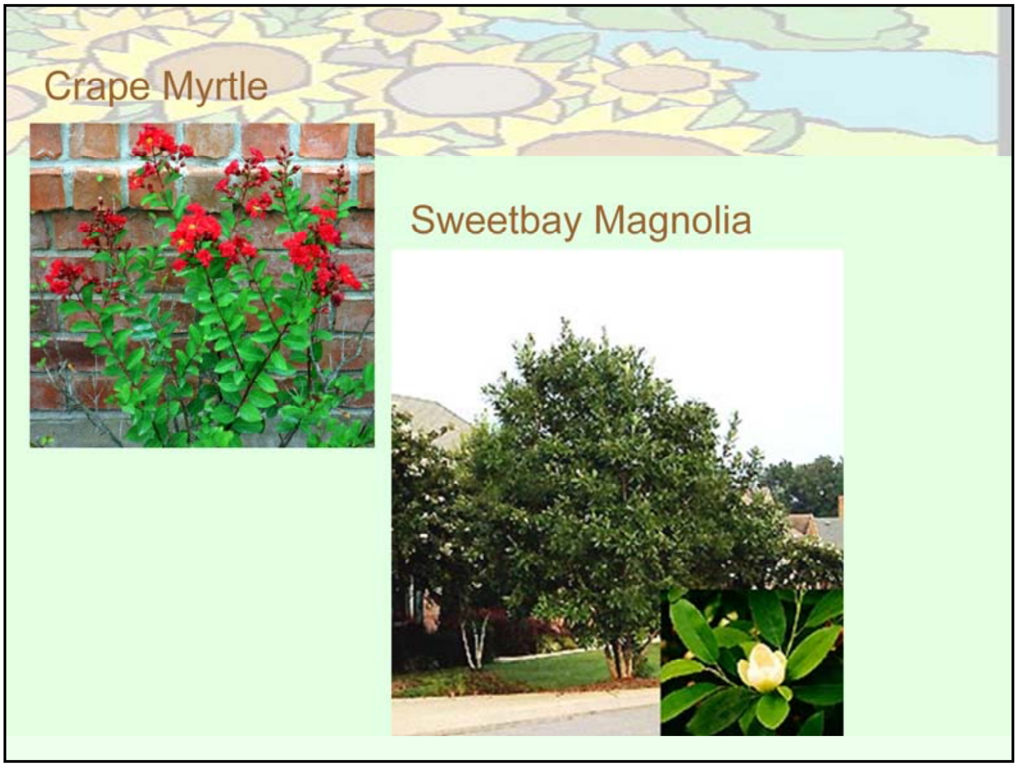
•Growth rate medium to fast



The red maple and ginkgo trees provide vibrant fall color and are good choices for Georgia

Ginkgo or Maidenhair Tree (*Ginkgo biloba*)
•Medium to large deciduous trees reaching heights of 200 ft.
•Urban trees more likely to reach less than 100 ft.
•Fall leaves bright yellow to golden
•Male or female trees – the female tree is less desirable because of the fruit it produces wh

Red Maple (*Acer Rubrum*)
•Sometimes called Swamp or Soft Maple
•Native to North America
•Mature height up to 60-90 ft.
•Has red flowers, petioles and red leaves in the fall



The Crape Myrtle and Sweetbay Magnolia are great for summer flowers.

Sweetbay Magnolia (*Magnolia virginiana*)
•Creamy white lemon-scented flowers
•Blooms from late spring into early fall
•Grows 40-60 ft. tall
•Leaves are 3-5 inch dark green leaves have silvery undersides

Crape Myrtle (*Lagerstroemia*)
Deciduous, small tree
•Summer flowering in several colors – light to dark pinks, lavenders and whites
•Heights 20-30 ft.
•Colorful bark
•Leaves bright golden to burnt red fall color

The Green Ash and Black Gum trees are deciduous native trees.

Black Gum (*Nyssa sylvatica*)
•Also commonly called Tupelo or Black Tupelo
•50-100 ft. tall in maturity
•Deep red fall color
•Dark green summer leaves
•Provides nectar for bees in spring during flowering
•Wildlife eat fruits
•Dark charcoal gray bark
•Slow to medium growing

Green Ash (*Fraxinus pennsylvanica*)
•Bright yellow fall color
•Fast growing
•50-60 ft. tall at maturity
•Dark green summer foliage
•Leaves change earlier than most other species in the late summer

Winter King Hawthorn (*Crataegus viridis* ‘Winter King’)

•Winter King cultivar recommended because of its disease resistance

•Provides food for birds in the winter

•Wide spreading 20-30 ft. tall at maturity

•Clusters of tiny white flowers in late winter or early spring

•Late summer and fall there are bright orange–red fruits

•Gray green foliage in the summer turns gold, yellow, scarlet and purple in autumn

•Sharp thorns are all over the branches and this plant should not be used where there may be children

Willow oak (*Quercus phellos*)

•Native tree species

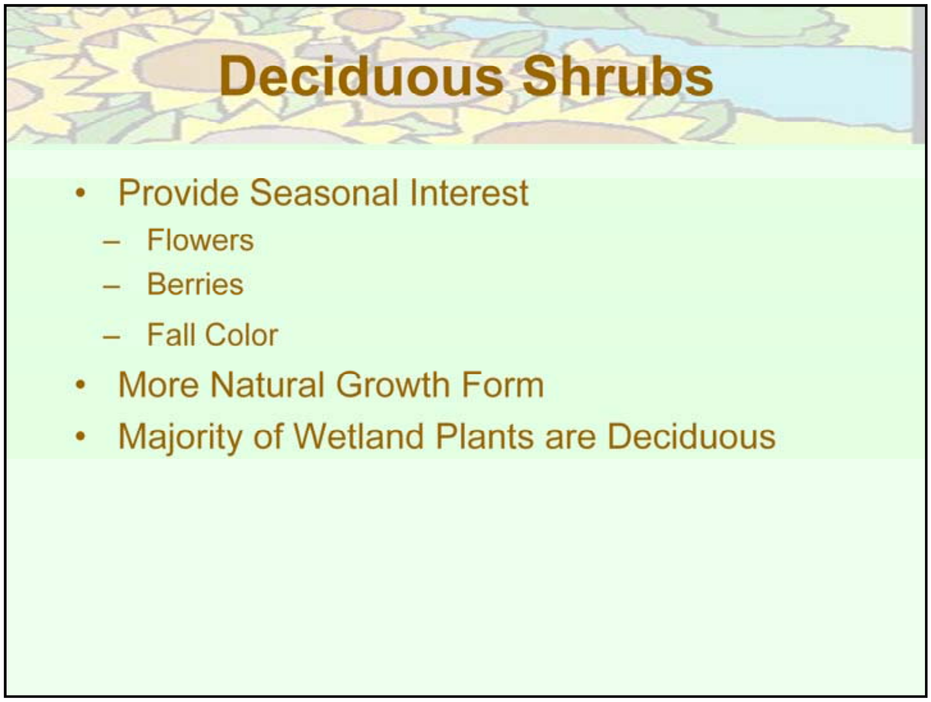
•Pollution tolerant tree does well in urban areas

•70 ft. tall at maturity

•Fast growing

•Leaves turn yellow to russet in the fall

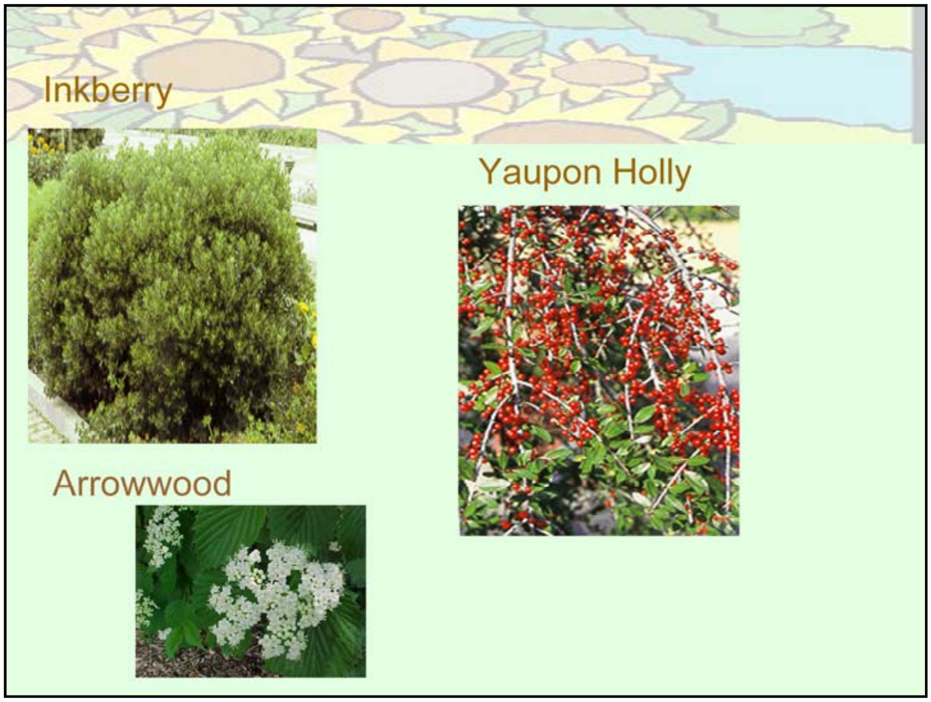
Here is a list of shrubs that will do well in a rain garden, but there are many others that could be considered appropriate. Many native azaleas are well suited to rain garden conditions. As a matter of fact, any native plant that thrives in the flood plain area of streams and rivers will likely do well in rain gardens.



When creating interest in the rain garden through the plants selected, it is important to look

Rain gardens are not typically formal in nature, so choosing shrubs that will fit where they a

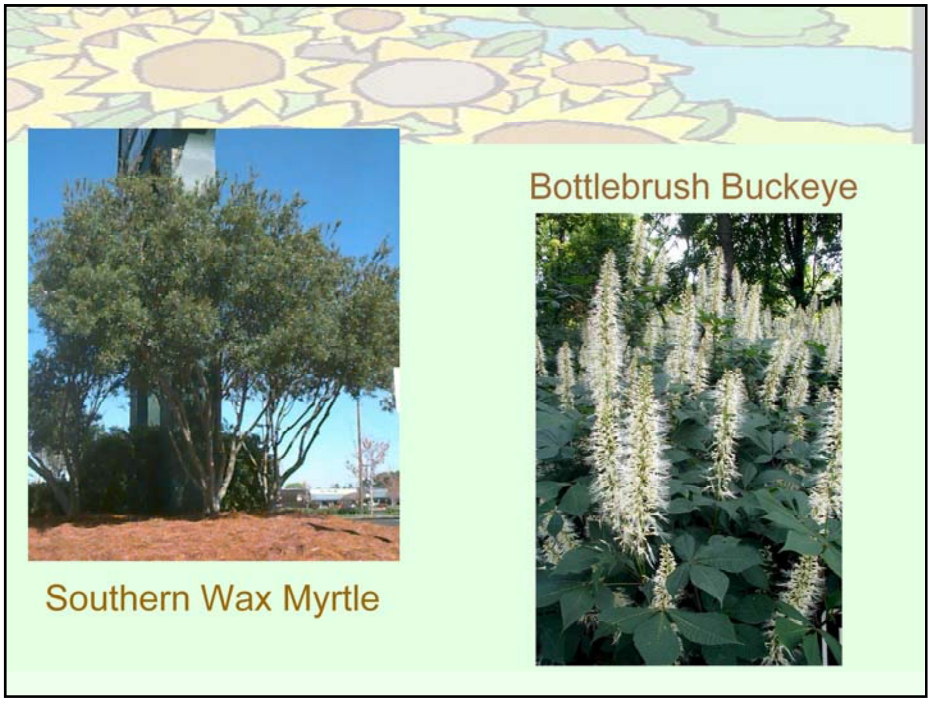
Wetland woody plants are typically deciduous, so there are not any good conifer shrub size



Inkberry *(Ilex Gabra)*
•An evergreen holly
•White flowers in early summer
•Black berries

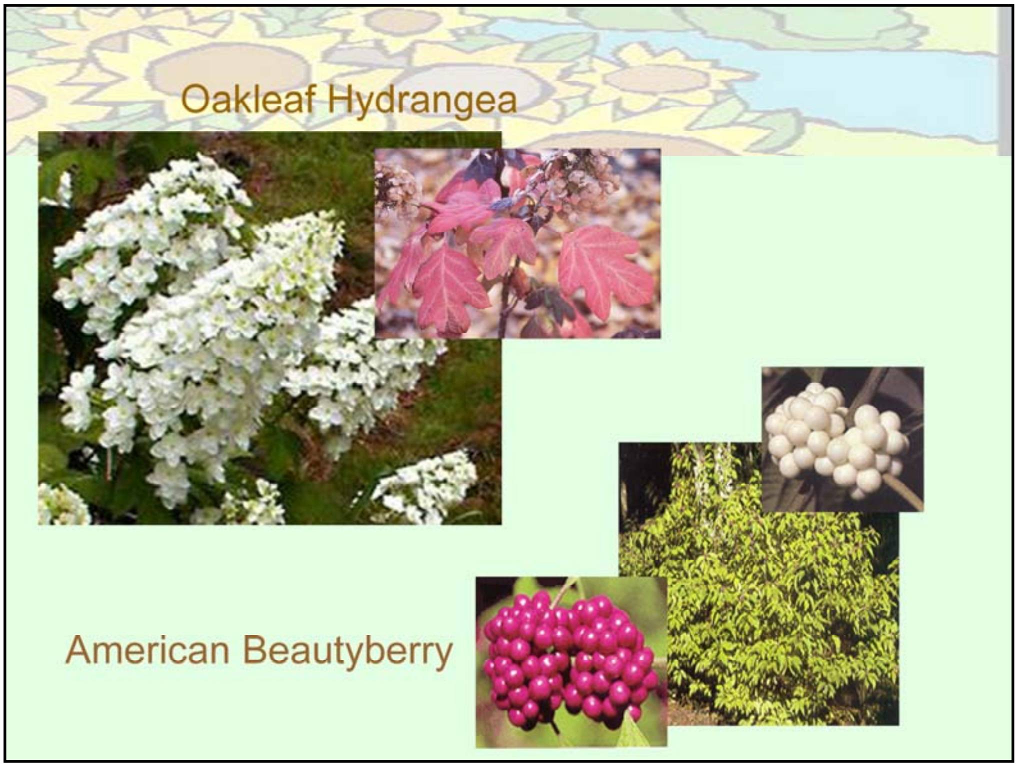
Arrowwood *(Viburnum Dentatum)*
•Flowering shrub with white flowers in spring
•Beautiful bronze fall foliage
•Bluish berry clusters in fall
•Can grow 6-15 ft. in height

Yaupon Holly (*Ilex vomitoria*)
This holly has small rounded leaves.
The picture shows a weeping form yaupon holly.
•Comes in many forms from dwarf to weeping to upright tall
•Evergreen with bright red berries in fall and winter



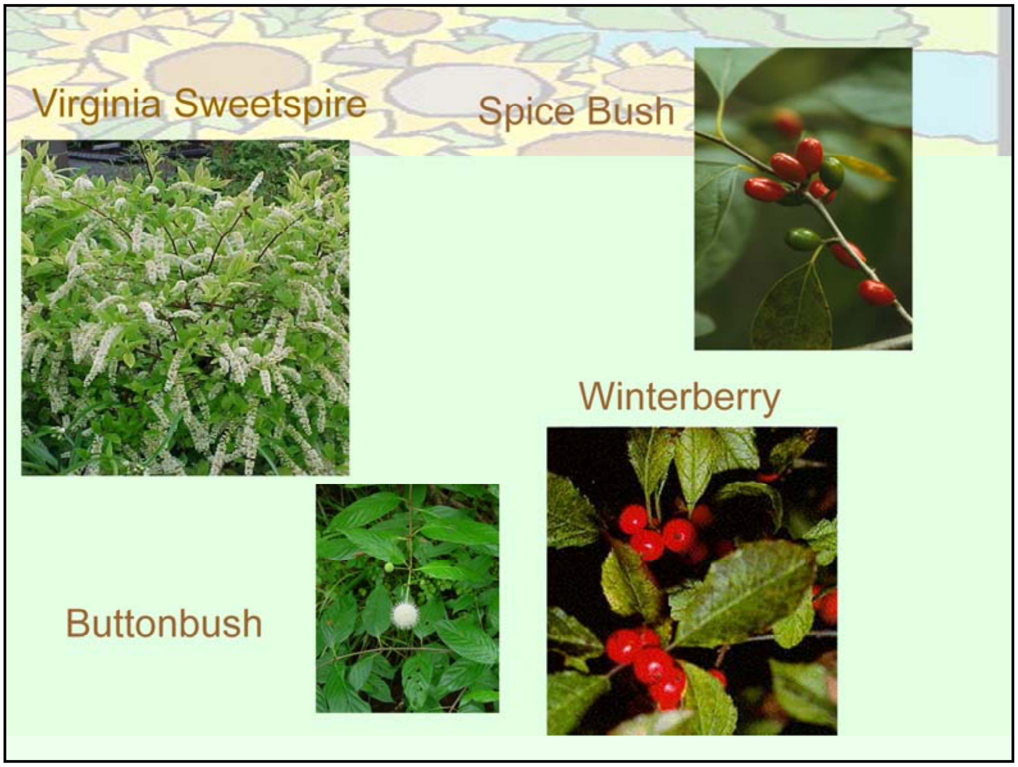
Southern Wax Myrtle (*Myrica cerifera*)
•8-15 ft. tall and wide
•Evergreen
•Long, narrow glossy green leaves

Bottlebrush Buckeye (*Aesculus parviflora*)
•Flowers in July with long white panicles
•8-12 ft. tall
•Large dark green leaves in summer



Oakleaf Hydrangea (*Hydrangea quercifolia*)
•6-8 ft. tall and wide
•Deciduous shrub
•White cone-shaped flower clusters
•Leaves as large as 9 inches in a lobed oak like shape
•Fall color of rose, claret and burgundy

American Beautyberry (*Callicarpa dichotoma*)
•Deciduous shrub
•Up to 6 ft. in height
•Blooms in July with light purple flowers
•Flowers occur along twigs at the base of leaf axils
•Dark red or purple berries in fall attract birds



Virginia Sweetspire (*Itea virginica*)
•Sweet smelling white blooms (3-6 inch spikes) in late spring and last up to 6 weeks
•Showy red and purple fall color
•4-5 ft. high and usually wider
•Growth rate medium
•Light: full sun to full shade

Spice Bush (*Lindera benzoin*)
•Deciduous shrub that grows 6-12 ft. tall and 6-10 ft. wide
•Brilliant yellow fall color
•Shiny greenish yellow spicily fragrant flowers in late winter
•Scarlet red spicy scented fruit in fall

Buttonbush (*Cephalanthus occidentalis*)
•Large deciduous shrub with scaly gray bark
•Leaves are dark green and smooth edged and shiny
•Dense, ball-like clusters of tiny tubular white flowers appear in summer
•Round clusters of brown nutlets in fall
•3-6 ft. high and wide
•Fast growth rate

Here are some groundcovers that will work well inside of rain gardens.

Shuttleworth Ginger *(Asarum shuttleworthii)*
•A native Asarum
•2-5 inches in height
•Glossy dark green oval to round leaves with silvery veining
•Partial sun to full shade
•Purple flowers in mid-spring that are mostly hidden under leaves

Partridge Berry *(Mitchella repens)*
•Evergreen creeping vine
•Small (less than 1 inch) dark green round leaves
•White flowers in spring with red berries later

Mondograss *(Ophiopogen japonicus)*
•Evergreen clumpy grass like fine textured leaves
•6-10 inches in height
•Sun to shade
•Flowers in summer with lavender to white flowers

Ajuga *(Ajuga reptans)*

This list is just the beginning of the herbaceous plants that will adapt well to rain garden conditions. These plants are all perennials in Georgia. Consider the sunlight exposure of your rain garden and choose appropriate plants.

Canna Lilies (*Canna*)

•3-6 ft. tall

•Green, purple or reddish-purple leaves

•Flower colors range from reds, oranges, pinks, yellows

Ironweed (*Vernonia altissima*)

•Herbaceous plant that can reach 10 ft. tall

•Large lance shape leaves

•Deep purple flowers in clusters of 13-30 flowers and about ½ inch each

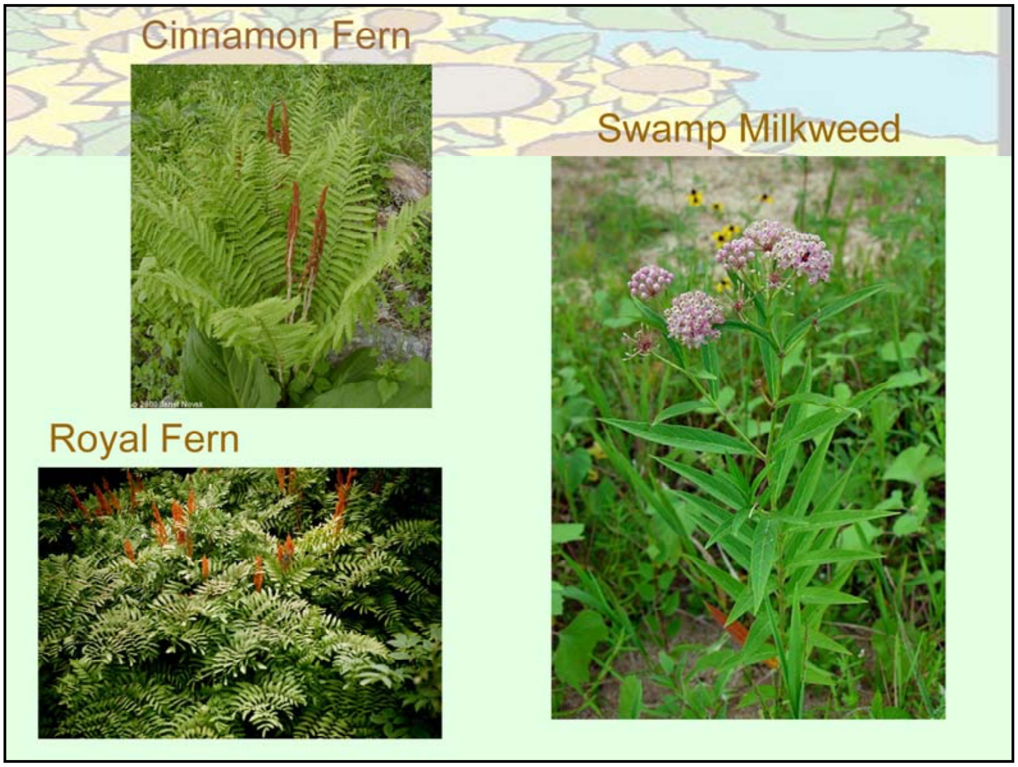
St. John’s Wort (*Hypericum perforatum*)

•Yellow five-petaled flowers about 20 mm in size

•Blooms in late spring and early to mid summer

•Can be a low growing species for a ground cover or larger growing species that grow up to 4 ft. tall

•Rhizomatous perennial



Cinnamon Fern (*Osmunda cinnamomea*)
•Light brown cinnamon stick looking fronds grow above greenery in late spring
•Deciduous fern
•Mature height can be 2-5 ft. with a 4 ft. spread
•Needs shady locations

Royal Fern (*Osmunda regalis*)
•Deciduous fern
•Native fern to the Americas
•Grows naturally in woodland bogs
•A large fern species that may grow up to 5 ft. tall and 8 ft. wide

Swamp Milkweed (*Asclepias incarnata*)
•Native to the United States
•Deciduous
•2-4 ft. in height with most flowers occurring at the top of the plant
•Flowers ¼ inch pink to red to purple
•Flowers in June to August
•Favorite host plant of Monarch butterflies and caterpillars

Asters (*Aster*)

•Most bloom in the fall but some species may have blooms in spring and summer

•Flower colors range from mauve to purple to blue to pink to red and white

•Variety of mature heights from 6-7 ft.

•Some varieties are susceptible to mildew so choose mildew resistant varieties

Joe Pye Weed (*Eupatorium purpurem*)

•Native plant

•Mature height 5-7 ft.

•Large purple flowers in the fall

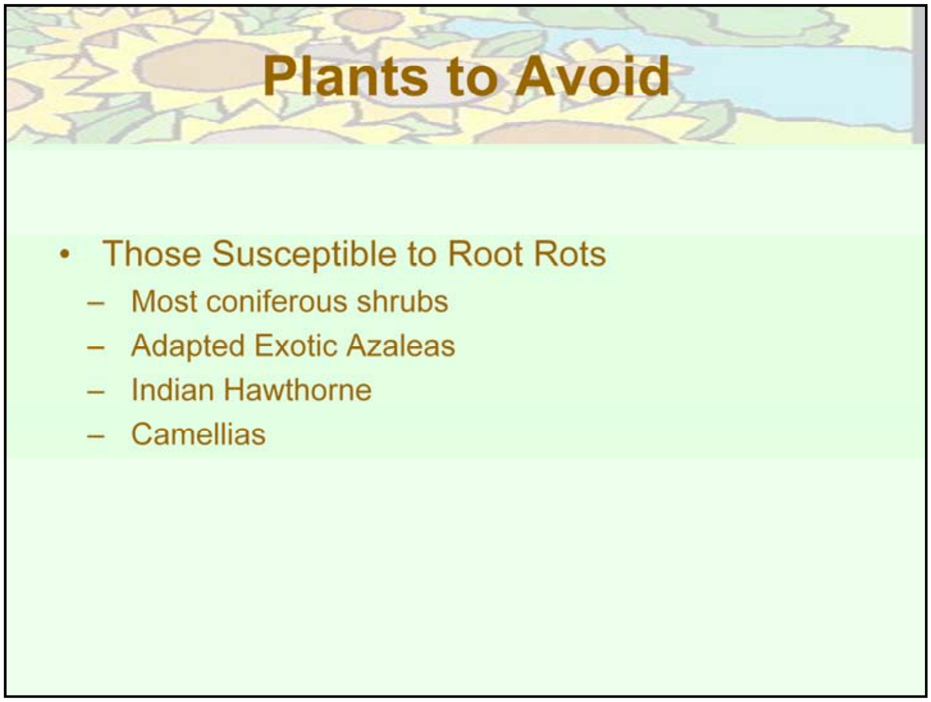
Blackeyed Susan (*Rudbeckia fulgida*)

•Native wildflower

•Summer to fall blooms in golden-yellow

•Mature height of 2-3 ft.

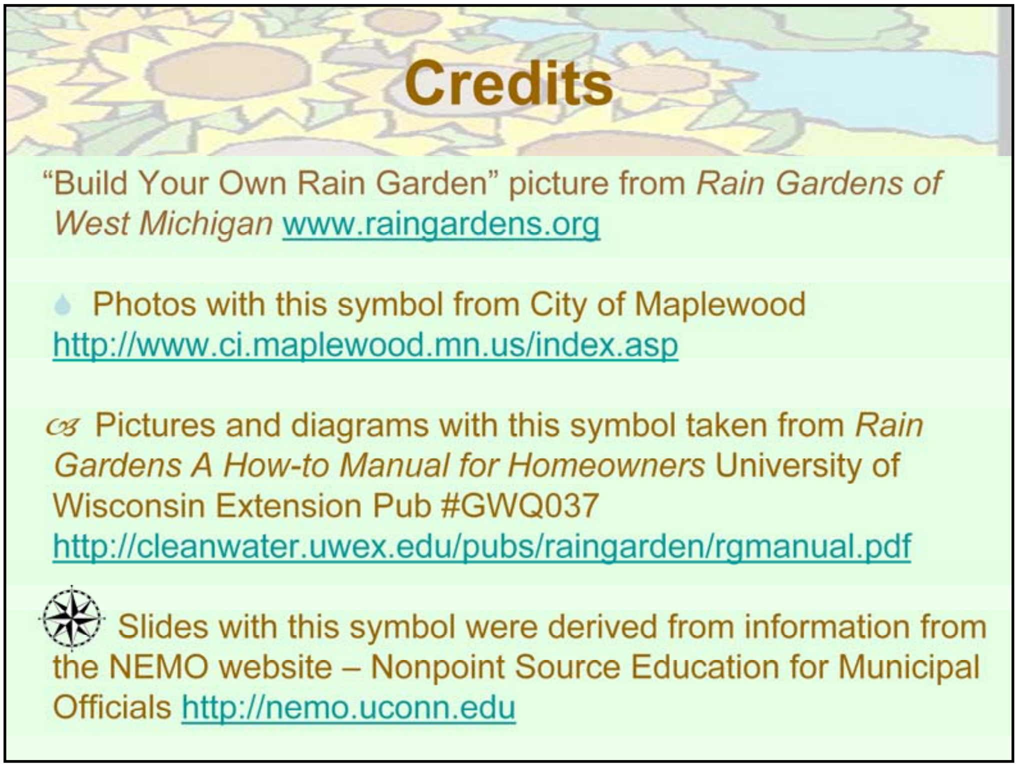
There are some ornamental grasses that will do well in rain gardens such as Upland Sea Oats. Upland Sea Oats (*Chasmanthium latifolium*) is a native, deciduous, clump forming, perennial grass. The summer foliage will reach a height of 2-3 feet and is topped with inflorescences reminiscent of the Coastal Sea Oats. This plant performs well in moist or dry sites and will tolerate light shade to full sun. In Georgia, the mature grain heads are easily transported by water and can often germinate in undesirable places.



There are many plants that will not do well within the rain garden, particularly plants that ar

As mentioned previously, most coniferous shrubs cannot survive the wet soil conditions tha

Maintenance needs of rain garden areas are the same as for any other landscape feature



Many of the pictures about stormwater issues and rain gardens are from web sites and other publications. Symbols to indicate the source of pictures are embedded in each picture that has been borrowed for this presentation.

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Pictures of individual plants from:

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- Gary Wade, Horticulture Specialist, Georgia Cooperative Extension
- Allen Caldwell, County Extension Director, North Carolina Cooperative Extension
- Erv Evans, Horticulture Specialist, North Carolina Cooperative Extension
- Henriette Kress, www.henriettesherbal.com

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The following Georgia Cooperative Extension publications are recommended for further reading to help in choosing appropriate plants and methods for establishing plants for rain gardens.

A Compilation of Low Maintenance Plants for Georgia Landscapes
http://pubs.caes.uga.edu/caespubs/horticulture/H-91-009.htm

Environmentally Friendly Landscape Practices
http://pubs.caes.uga.edu/caespubs/horticulture/H-00-060.htm

Landscape Plants for Georgia
http://pubs.caes.uga.edu/caespubs/pubcd/B625.htm

Soil Preparation and Planting Procedures for Ornamental Plants in the Landscape
http://www.ces.uga.edu/pubcd/B932-w.htm

Soil Testing for Home and Gardens
http://pubs.caes.uga.edu/caespubs/pubs/PDF/L387.pdf

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