

RAIN GARDENS

SINGLE FAMILY RESIDENTIAL GUIDE
 CITY OF ATLANTA, GEORGIA
 DEPARTMENT OF WATERSHED MANAGEMENT



Rain gardens are small, landscaped depressions that are filled with a mix of native soil and compost, and are planted with trees, shrubs and other garden-like vegetation. They are designed to temporarily store stormwater runoff from rooftops, driveways, patios and other areas around your home while reducing runoff rates and pollutant loads in your local watershed. A rain garden can be a beautiful and functional addition to your landscape.



Location

- Rain gardens should be located to receive the maximum amount of stormwater runoff from impervious surfaces, and where downspouts or driveway runoff can enter garden flowing away from the home.
- Swales, berms, or downspout extensions may be helpful to route runoff to the rain garden.
- Locate at least 10 feet from foundations, not within the public right of way, away from utility lines, not over septic fields, and not near a steep bluff edge. Call 811 before you dig to locate the utility lines on your property.
- Rain gardens on steep slopes (>10%) may require an alternative design with terracing.

Design

- The size of the rain garden will vary depending on the impervious surface draining to it and the depth of the amended soils. Use the table to determine the required surface area.
- A maximum ponding depth of 6 inches is allowed within rain gardens. On average, rain gardens drain within a day which will not create a mosquito problem.
- Design rain garden entrance to immediately intercept inflow and reduce its velocity with stones, dense hardy vegetation or by other means.
- If sides are to be mowed rain gardens should be designed with side slopes of 3:1 (H:V) or flatter.
- For best results, it is suggested to test your soil characteristics as you would for a garden, or contact your local County Extension Service for help www.caes.uqa.edu/extension/fulton.
- Soils for rain gardens should be amended native soils containing: 2/3 native soils and 1/3 compost.

Contributing Drainage Area (square feet)	Depth of Amended Soil (inches)			
	18	24	30	36
	Area of Rain Garden (square feet)			
100	6.6	5.7	5.1	4.6
500	35	30	25	23
1000	65	60	50	45
2000	135	115	100	90
3000	200	170	150	140
4000	260	230	200	185
5000	330	290	255	230

- A mulch layer consisting of 2-3 inches of non-floatable organic mulch (fine shredded hardwood mulch, pine straw, or leaf compost) should be included on the surface of the rain garden. Pine bark and wood chips should not be used.
- Often rain gardens have a better appearance and can be more easily maintained if they have defined edges similar to a normal garden.
- The overflow from the rain garden should be non-eroding and can consist of a small berm or even an inlet grate set at the proper elevation in the garden. The grate should be set at a slant or be domed to allow clogging debris to fall off.

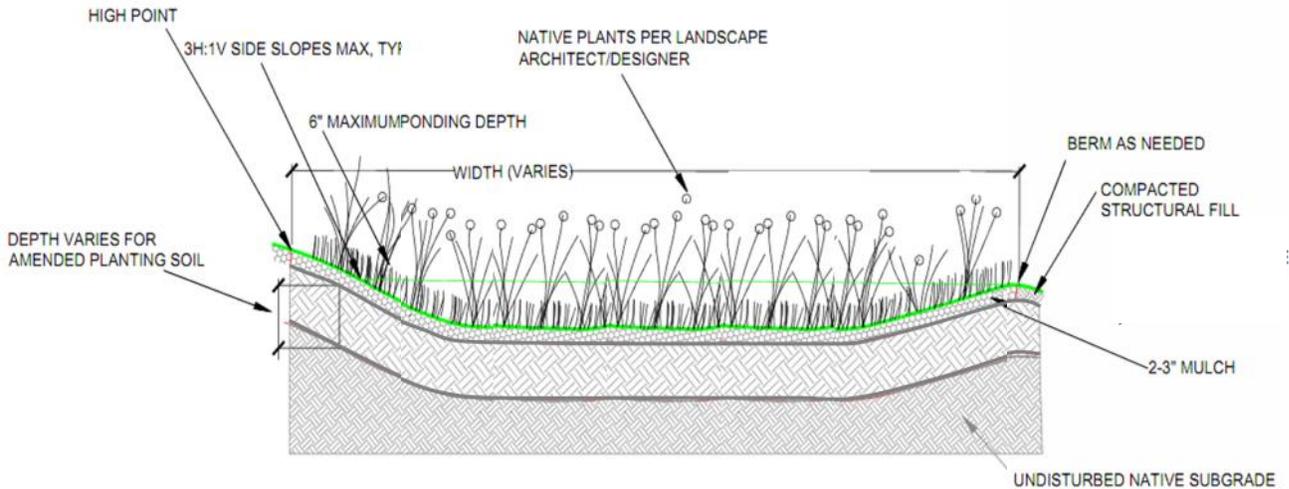
Vegetation

- Vegetation commonly planted in rain gardens includes native trees, shrubs and other herbaceous vegetation. When developing a landscaping plan, you should choose vegetation that will be able to stabilize soils and tolerate the stormwater runoff rates and volumes that will pass through the rain garden.
- Vegetation used in rain gardens should also be able to tolerate both wet and dry conditions. See Appendix F of Volume 2 of the Georgia Stormwater Management Manual (ARC, 2001) for a list of grasses and other plants that are appropriate for use in rain gardens in the state of Georgia. Please refer elsewhere within this document for additional information on plants appropriate for rain gardens.
- As with any garden in the first season the vegetation may require irrigation to become well established. It may be appropriate to plant more densely than a normal garden to obtain the benefit of plant soil stabilization and evapotranspiration as soon as possible.

Maintain

Routine garden maintenance should include weeding, deadheading, replacing dead plants, and replenishing mulch when depleted. Catching areas of erosion is also important as is correcting standing water problems. If standing water persists it may be necessary to place a perforated underdrain in the garden daylighting downstream.





CONSTRUCTION STEPS:

1. Locate rain garden(s) where downspouts or driveway runoff can enter garden flowing away from the home. Locate at least 10 feet from foundations, not within the public right of way, away from utility lines, not over septic fields, and not near a steep bluff edge.
2. Measure the area draining to the planned garden and determine required rain garden surface area from the table on the next page and your planned excavation depth.
3. Optionally, perform infiltration test according to Appendix A. If the rate is less than 0.25 in/hr an underdrain will be necessary. If the rate is more than 0.50 in/hr the size of the garden may be decreased 10% for every 0.50 in/hr infiltration rate increase above 0.50 in/hr.
4. Measure elevations and stake out the garden to the required dimensions insuring positive flow into garden, the overflow elevation allows for six inches of ponding, and the perimeter of the garden is higher than the overflow point. If the garden is on a gentle slope a berm at least two feet wide can be constructed on the downhill side and/or the garden can be dug into the hillside taking greater care for erosion control at the garden inlet(s).
5. Remove turf or other vegetation in the area of the rain garden. Excavate garden being careful not to compact soils in the bottom of the garden. Level bottom of garden as much as possible to maximize infiltration area.
6. Mix compost, topsoil, and some of the excavated subsoil together to make the 'amended soil'. The soil mix should be 1/3 compost, 2/3 native soil (topsoil and subsoil combined).
7. Fill rain garden with the amended soil, leaving the surface eight inches below your highest surrounding surface. Eight inches allows for 6 inches ponding and 2" of mulch. The surface of the rain garden should be as close to level as possible.
8. Build a berm at the downhill edge and sides of the rain garden with the remaining subsoil. The top of the berm needs to be level, and set at the maximum ponding elevation.
9. Plant the rain garden using a selection of plants from elsewhere in this manual.
10. Mulch the surface of the rain garden with two to three inches of non-floating organic mulch. The best choice is finely shredded hardwood mulch. Pinestraw is also an option.
11. Water all plants thoroughly. As in any new garden or flower bed, regular watering will likely be needed to establish plants during the first growing season.
12. During construction build the inlet feature as a pipe directly connected to a downspout or use a rock lined swale with a gentle slope. Use of an impermeable liner under the rocks at the end of the swale near the house is recommended to keep water from soaking in at that point. Test the drainage of water from the source to the garden prior to finishing.
13. Create an overflow at least 10 feet from your property edge and insure it is protected from erosion.

<p>CITY OF ATLANTA DEPARTMENT OF WATERSHED MANAGEMENT</p>	<p>NAME/ADDRESS:</p>	<p>RAIN GARDEN SPECIFICATIONS PAGE 1 OF 2</p>
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SKETCH LAYOUT

PROVIDE PLAN VIEWS OF RAIN GARDEN AND HOUSE SHOWING DRAINAGE AREA DIRECTED TO RAIN GARDEN AND KEY DIMENSIONS AND OVERFLOW AREA RELATIVE TO PROPERTY LINE.

SIZING CALCULATION:

Contributing Drainage Area (square feet)	Depth of Amended Soil (inches)			
	18	24	30	36
	Area of Rain Garden (square feet)			
100	6.6	5.7	5.1	4.6
500	35	30	25	23
1000	65	60	50	45
2000	135	115	100	90
3000	200	170	150	140
4000	260	230	200	185
5000	330	290	255	230

MEASURE CONTRIBUTING DRAINAGE AREA AND READ AREA FOR GIVEN MEDIA DEPTH.

CONTRIBUTING DRAINAGE AREA= _____ SQ FT
 DEPTH OF SOIL MEDIA= _____ INCHES
 AREA OF RAIN GARDEN= _____ SQ FT

MAINTENANCE:

1. IRRIGATE VEGETATION AS NEEDED IN FIRST SEASON
2. REMOVE WEEDS
3. REPLACE UNSUCCESSFUL PLANTINGS
4. REPLENISH MULCH
5. REPAIR ERODED AREAS
6. RAKE CLOGGED SURFACE TO RESTORE INFILTRATION
7. MONITOR RAIN GARDEN FOR APPROPRIATE DRAINAGE TIMES IF GARDEN DOES NOT DRAIN AN UNDERDRAIN MAY BE NECESSARY

CITY OF ATLANTA
DEPARTMENT OF WATERSHED
MANAGEMENT

ATTACH THIS TWO-PAGE
SPECIFICATION TO HOUSE PLAN
SUBMITTAL

RAIN GARDEN
SPECIFICATIONS
PAGE 2 OF 2

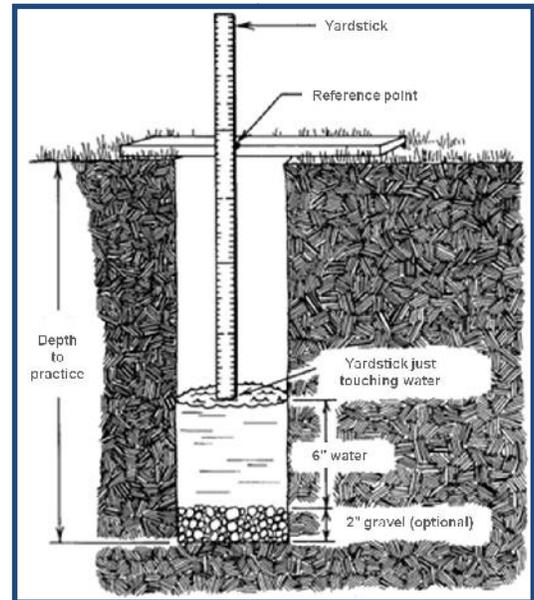
APPENDIX A

Testing Infiltration: the Simple Approach

It is assumed that an infiltration rate of 0.25 to 0.50 inches per hour exists on residential sites. The sizing criteria are set for this rate. However, if the soils have a higher infiltration rate the size of the features could be reduced. At the discretion of the property owner the following infiltration test can be conducted, and if it returns a higher infiltration rate than 0.50 inches per hour suitable reductions in the size of the infiltration-based facilities can be made. See each practice for the adjustment procedure.

Infiltration features (rain gardens, dry wells, permeable paver gravel layers) should reliably drain within the recommended time limit. Here is how to test if your soils can handle this type of feature.

1. Locate the approximate center of the area where you expect to build your feature.
2. Dig an access pit down to the bottom of the amended soils or gravel layer in the feature.
3. At that elevation dig a narrow test hole at least eight inches deep. You can optionally place 2" of coarse gravel in the bottom. The test hole can be excavated with small excavation equipment or by hand using a spade shovel or post-hole digger.
4. If you run into a hard layer that cannot be penetrated with a shovel or, you come across water in the hole, stop. Infiltration features should not be sited over impenetrable rock surfaces or over high water tables, so your site is inappropriate.
5. Place a flat board across the hole to serve as a measuring point (see figure).
6. Fill the hole with water to a depth of six inches. Measure from the flat board to the water surface. Record the exact time you stop filling the hole and the height of the water every 10 minutes for fast draining soils for a minimum of one hour or every 30 minutes for slow draining soils for a minimum of two hours.
7. Refill the hole again and repeat step 5 twice more. The third test will give you the best measure of how quickly your soil absorbs water when it is fully saturated.
8. If on the third test the water is dropping at least $\frac{1}{2}$ " per hour the soil will work for the infiltration features.



Source: modified from www.ag.ndsu



Source: www.learntogrow.com

APPENDIX B

Recommended Plants

Plants for rain gardens and other vegetated stormwater practices must be able to tolerate both wet and dry conditions. This list, while not exhaustive, includes many plants that will tolerate conditions in rain gardens. The plants in this list do have different preferences for both moisture and light, as shown in the columns labeled 'Moisture' and 'Sun'. Additionally, the majority of these plants are native to Georgia and thus contribute the added benefit of providing habitat and food for native pollinators and wildlife. Those plants that are not native to Georgia are marked with an asterisk (*).

Key

Height: Typical height range for mature plants

Moisture: The amount of soil moisture that plants will tolerate is defined as follows:

W (Wet) —Frequently saturated soils

M (Moist) —Moist soils that are periodically inundated.

D (Dry) — Areas not flooded after rains and frequently dry between rains. Plants designated 'D' will tolerate drought conditions

Sun: the amount of sunlight that plants require is defined as follows:

F (Full) Direct sunlight for at least 6 hours per day

P (Partial shade)—Direct sunlight for 3-6 hours per day, or lightly filtered light all day

S (Shade)—Less than 3 hours of direct sunlight per day, or heavily filtered light all day

	Botanical Name	Common Name	Height	Moisture	Sun
Small Trees	<i>Acer floridanum</i>	Southern Sugar Maple	20'-25'	M	F/P/S
	<i>Amelanchier arboria</i>	Serviceberry	15'-25'	W/M/D	F/P
	<i>Cercis canadensis</i>	Redbud	20'-30'	M	F/P
	<i>Chionanthus virginicus</i>	Fringe Tree	12'-20'	M	F/P
	<i>Cornus florida</i>	Flowering Dogwood	15'-30'	MD	F/P
	<i>Hamamelis virginiana</i>	Witchhazel	15'-30'	W/M	P/S
	<i>Ilex decidua</i>	Possumhaw	15'-25'	MD	F/P
	<i>Ilex vomitoria</i>	Yaupon Holly	20'-25'	MD	F/P
	<i>Lagerstroemia indica</i> *	Crape Myrtle *	15'-50'	MD	F/P
	<i>Magnolia virginiana</i>	Sweetbay Magnolia	10'-30'	W/M	F/P
	<i>Magnolia x soulangeana</i> *	Saucer Magnolia *	15'-25'	M	F/P
	<i>Vitex agnus-castus</i> *	Chaste Tree *	15'-20'	MD	F/P

	Botanical Name	Common Name	Height	Moisture	Sun
Med.- Large Trees	<i>Acer rubrum</i>	Red Maple	60'-90'	W/M/D	F/P
	<i>Betula nigra</i>	River Birch	40'-70'	W/M	F/P
	<i>Carpinus caroliniana</i>	Musclewood	30'-50'	W/M	F/P
	<i>Crataegus phaenopyrum</i>	Washington Hawthorne	25'-30'	W/M/D	F/P
	<i>Fraxinus pennsylvanica</i>	Green Ash	50'-70'	W/M/D	F
	<i>Ilex opaca</i>	American Holly	30'-60'	MD	F/P
	<i>Magnolia grandiflora</i>	Southern Magnolia	40'-80'	MD	F/P
	<i>Magnolia macrophylla</i>	Bigleaf Magnolia	30'-40'	M	F/P
	<i>Nyssa sylvatica</i>	Black Gum	35'-70'	W/M/D	F/P
	<i>Platanus occidentalis</i>	American Sycamore	75'-100'	W/M	F
	<i>Quercus lyrata</i>	Overcup Oak	35'-50'	MD	F
	<i>Quercus bicolor</i>	Swamp White Oak	50'-60'	W/M/D	F/P
	<i>Quercus phellos</i>	Willow Oak	60'-80'	W/M/D	F/P
	<i>Salix babylonica</i> *	Weeping Willow *	30'-50'	W/M	F
	<i>Taxodium distichum</i>	Bald Cypress	50'-100'	W/M/D	F/P

* denotes plants not native to Georgia

	Botanical Name	Common Name	Height	Moisture	Sun
Shrubs- Evergreen	<i>Ilex glabra</i>	Inkberry	6'-8'	M	F/P
	<i>Ilex vomitoria nana</i>	Dwarf Yaupon Holly	5'	W/M/D	F/P
	<i>Illicium floridanum</i>	Florida Anise Tree	10'-15'	M	P/S
	<i>Illicium parviflorum</i>	Small Anise Tree	7'-10'	M/D	F/P
	<i>Myrica cerifera</i>	Southern Waxmyrtle	10'-15'	W/M/D	F/P

	Botanical Name	Common Name	Height	Moisture	Sun
Shrubs- Deciduous	<i>Callicarpa americana</i>	Beautyberry	6'	M/D	F/P
	<i>Cephalanthus occidentalis</i>	Buttonbush	3'-10'	W	F
	<i>Clethra alnifolia</i>	Summersweet	5'-10'	W/M/D	F/P
	<i>Cornus amomum</i>	Silky Dogwood	6'-12'	W/M	F/P/S
	<i>Hibiscus moscheutos</i>	Swamp Mallow	4'-8'	W/M	F/P
	<i>Hypericum densiflorum</i>	Bushy St Johns wort	4'-6'	M/D	F/P
	<i>Ilex verticillata</i>	Winterberry	6'-10'	W/M	F/P
	<i>Itea virginica</i>	Virginia Sweetspire	4'	W/M/D	F/P
	<i>Lindera benzoin</i>	Spicebush	6'-12'	W/M/D	F/P
	<i>Sambucus canadensis</i>	Elderberry	6'-15'	W/M	F/P
	<i>Viburnum acerifolium</i>	Mapleleaf viburnum	3'-6'	M/D	M/S
	<i>Viburnum dentatum</i>	Arrowwood	5'-10'	W/M/D	F/P
	<i>Viburnum nudum</i>	Possumhaw	6'-12'	W/M/D	F/P/S

	Botanical Name	Common Name	Height	Moisture	Sun
Grasses and Allies	<i>Acorus calamus</i>	Sweet Flag	2'-4'	W/M	F/P/S
	<i>Carex</i> spp	Sedges	up to 3'	varies	varies
	<i>Chasmanthium latifolium</i>	River Oats	3'-5'	W/M/D	F/P/S
	<i>Juncus effusus</i>	Soft Rush	1'-4'	W/M	F/P/S
	<i>Juncus tenuis</i>	Path Rush	under 12"	W/M	F/P/S
	<i>Liriope muscari</i> *	Monkey Grass *	18"-24"	M/D	F/P/S
	<i>Muhlenbergia capillaris</i>	Pink Muhly Grass	3'-4'	M/D	F/P/S
	<i>Ophiopogon japonicus</i> *	Mondo Grass *	under 12"	M/D	F/P/S
	<i>Panicum virgatum</i>	Switchgrass	2'-9'	W/M/D	F/P/S
	<i>Schizachyrium scoparium</i>	Little Bluestem	2'-4'	W/M/D	F/P/S
	<i>Sorghastrum nutans</i>	Indiangrass	4'-8'	M/D	F/P/S

	Botanical Name	Common Name	Height	Moisture	Sun
Herbaceous Perennials	<i>Amsonia hubrechtii</i>	Narrow Leaf Blue Star	2'-3'	M/D	F/P
	<i>Asclepias tuberosa</i>	Butterflyweed	1'-3'	M/D	F/P
	<i>Chrysogonum virginianum</i>	Green and Gold	6"	M/D	P/S
	<i>Coreopsis verticillata</i>	Threadleaf Coreopsis	8"-20"	M/D	F/P
	<i>Echinacea purpurea</i>	Purple Cone Flower	1'-3'	M/D	F/P
	<i>Eupatorium fistulosum</i>	Joe Pye Weed	2'-7'	W/M/D	F/P
	<i>Hemerocallis</i> spp. *	Daylily *	1'-3'	M/D	F/P
	<i>Iris sibirica</i> *	Siberian Iris *	1'-3'	W/M/D	F/P
	<i>Iris virginica</i>	Blue Flag Iris	12"-24"	W/M	F/P
	<i>Lobelia cardinalis</i>	Cardinal Flower	2'-4'	W/M	F/P
	<i>Monarda didyma</i>	Beebalm	2'-4'	W/M	F/P
	<i>Osmunda cinnamomea</i>	Cinnamon Fern	up to 4'	W/M	F/P/S
	<i>Osmunda spectabilis</i>	American Royal fern	2'-5'	W/M	P/S
	<i>Phlox divaricata</i>	Woodland Phlox	12"-18"	M	P/S
	<i>Phlox stolonifera</i>	Creeping Phlox	6"-12"	M/D	F/P/S
	<i>Polystichum acrostichoides</i>	Christmas Fern	1'-3'	M/D	P/S
	<i>Rudbeckia fulgida</i>	Orange Coneflower	18"-36"	M/D	F/P
	<i>Rudbeckia hirta</i>	Black-Eyed Susan	12"-36"	M/D	F/P
	<i>Solidago</i> spp.	Goldenrod	1'-4'	W/M/D	F/P
	<i>Tiarella cordifolia</i>	Foamflower	6"-12"	M	P/S

* denotes plants not native to Georgia