CleanScapes:

Keep the rain,
not the runoff!

Residential Stormwater Solutions:

Program Criteria

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Introduction:

The information in this manual will help you connect with resources in Howard County, financial and otherwise, that can help you implement the best stormwater management practice on your property. As a Howard County resident, you can make a big impact on reducing stormwater pollution by increasing the number of surfaces on your property that absorb stormwater runoff. In addition to protecting the environment by reducing runoff, you can also reduce your Watershed Protection Fee and/or be reimbursed for your practice.

Why Should I Install?

Think about your car before and after a rain storm. It looks cleaner, doesn't it? All of the dirt, oil, and road pollution that used to be on your car washed down the street and likely went down a storm drain without treatment. Now all of the things that you didn't want on your car are in

local water bodies. The same process happens with your house and driveway, although you might not have noticed it. Stormwater runoff is responsible for 20% of water pollution to the Chesapeake Bay. As you might guess, this has reduced the health of our local waterways including the Patuxent River and the Patapsco South Branch. You can stop runoff in its tracks by installing a stormwater Best Management Practice (BMP). If you choose to install a BMP, we will thank you for your efforts by issuing you financial incentives: credits toward the annual Watershed Protection Fee and reimbursements. We recommend that you familiarize yourself with these requirements before installing a BMP. Underlined words in this guide are defined in the "definition of terms" section.

Why are the requirements so specific?

The first inch of rainfall or "first flush" washes most of the pollutants off of impervious (hard) surfaces; we hope that your practices will capture this first inch and filter out the pollutants before they can negatively impact local water.

Specific equations are used to calculate the amount of runoff that comes off of an impervious surface during the first inch of rainfall. This is where we get the number in the "volume (ft^3)" column—it is the amount of water that your practice must be able to hold to capture and treat that very important first inch

of rainfall. We will show you examples of how to calculate the volume yourself and how to make sure that your practice has the right measurements to hold that volume in Appendix B.

Don’t worry, if you have questions about calculations in this guide or figuring out your drainage area, you can always email jcostantino@howardcountymd.gov for help! Read on for the types of practices that are eligible for incentives and how to meet the requirements.

Rain garden at Franciscan Friars

Rain Gardens:

Rain gardens are gardens filled with native plants and absorbent soil that are shaped to collect and filter water when it rains. Rain gardens are not only beautiful and attractive to local wildlife, but can also help solve drainage and pooling problems in your yard.

Your rain garden must meet the requirements at the bottom of the page to be eligible for reimbursement and/or credit against the annual Watershed Protection Fee.

Note that "volume (ft^3)" refers to the maximum volume of stormwater runoff which can be contained in the ponding area. Volume can be measured by multiplying the ponding depth, by the ponding area. See Appendix B for help calculating this figure.

The drainage area must be impervious surface which is directed to the rain garden for treatment. Rain gardens must drain within a reasonable time (24-48 hours) to be considered for credit and reimbursement.

Rain gardens are eligible for reimbursement of 50% of the cost incurred up to $1,200. Your rain garden must meet the following criteria to be considered for credit and reimbursement:

Rain Garden Minimum Requirements:

Best Management Practice (BMP)	Lot size/type	Drainage Area (ft^2)	Volume (ft^3)	Other Conditions	Eligible for Credit and Reimbursement?	Reimbursement Cap
Rain Garden	Condominium or Townhouse	250	14.84	Rain garden must not contain design flaws, fail to treat water quality, or create drainage problems.	Yes	50% of project, up to $1,200
	Single Family Home on ¼ acre or less	500	29.96			
	Single Family Home on Greater Than ¼ Acre	1000	59.37			

What does this mean for me?

Let's say you live in a single family home on 0.20 acres (less than ¼ acre). The landscaper that you found using the list in Appendix D has directed 500 square feet of roof top (this is your drainage area) into your rain garden. The garden's ponding area, or the bowl-shaped area of your garden, is 6 inches deep and 10 feet by 6 feet. This would put you at 30 ft^3 of volume in the ponding area, which is just above our minimum of 29.96 ft^3. So, your rain garden would be eligible for reimbursement and credit. You saved receipts, took pictures before, during, and after your project. See appendix B for more help with sizing and calculations.

Rain Barrels/Cisterns:

Rain barrels and cisterns are large storage containers, often attached to downspouts, which collect precipitation during storms. This will slow the flow of stormwater that would otherwise be coming very quickly off of your roof. The collected water can be used to water lawns and gardens (even your rain garden!).

Rain barrels are eligible for reimbursement of 50% of the cost incurred up to $500. Your rain barrel must meet the following criteria to be considered for credit and reimbursement:

Rain barrel/cistern minimum requirements:

Best Management Practice (BMP)	Lot Size/Type	Drainage Area (ft^2)	Volume (gallons)	Other Conditions	Eligible for Credit and Reimbursement?	Reimbursement Cap
Rain Barrel	Condominium or Townhouse	250	250	None	Yes	$500-maximum reimbursement is $1/gallon stored
	Single Family Home on ¼ Acre or Less	500	296			
	Single Family Home on Greater Than ¼ Acre	1000	592			

What does this mean for me?

Let's say you live in a single family home on 0.15 acres (less than ¼ acre). Your roof is 1000 square feet and you have 4 downspouts; so, each downspout drains 250 square feet of rooftop. You have connected 3 55-gallon rain barrels at two of your downspouts. So, you can store 330 gallons (6 barrels x 55 gallons each) of water (volume) coming from 500 square feet of roof (drainage area) and are eligible for reimbursement and credit. You saved receipts, took pictures before, during, and after your project. You spent $400—we would reimburse you $200. See appendix B for more help.

Conservation Landscaping:

Conservation landscapes are gardens that have de-compacted, amended soil and are mostly (if not entirely) filled with native plants. These gardens allow for stormwater infiltration and treatment, but are not as intensive in design or construction as rain gardens.

Conservation landscapes may receive reimbursement of 50% of the cost incurred up to $750. Your conservation landscape must meet the requirements below to be eligible for reimbursement and credit.

Conservation Landscape minimum requirements:

Best Management Practice (BMP)	Lot Size/Type	Drainage Area (ft^2)	Volume (ft^3)	Other Conditions	Eligible for Credit and Reimbursement ?	Reimbursement Cap
Conservation Landscape	Condominium or Townhouse	250	14.84	• 75% native plants (# of plants, not size of each, cost, or coverage area). • Replacement of turf, invasive species, or impervious surface only • No plants invasive to Maryland • 9" soil de-compaction, 2" soil amendment tilled into the 9" of soil de-compaction, • Minimum 2" of mulch at initial planting (maintain mulch coverage in future only in areas where there is no ground cover) • 250 ft^2 minimum of conservation landscaping. • Planting density to assume full coverage of landscaped area after a maximum of 5 years.	Yes	$250-$750; Maximum Reimbursement is $1/$ft^2$ up to $750
	Single Family Home on ¼ Acre or Less	500	29.96			
	Single Family Home on Greater Than ¼ Acre	1000	59.37			

What does this mean for me?

Let's say you live in a single family home on 0.6 acres (greater than a ¼ acre). Your roof is 4000 square feet and you have 4 downspouts; so, each downspout drains about 1000 square feet of rooftop. You planted a conservation landscape to catch the runoff from one of these downspouts, or 1000 square feet drainage area. You planted a 500 square foot conservation

landscape using native plants that you found using the materials in Appendix D. You also added compost (soil amendment) and de-compacted the soil with a tiller, improving the landscape's drainage and nutrient filtration. You saved receipts, took pictures before, during, and after your project. You spent $1,000; we would reimburse you 50% of that, or $500.

Pavement Removal:

Pavement removal is the direct removal of an impervious surface. This removal will help to slow down and spread out runoff if replaced with an appropriate alternative, like a conservation landscape or a rain garden.

Pavement removal is eligible for reimbursement of 50% of the cost incurred up to $1200. Please note that projects started after August 1, 2016 cannot receive reimbursement for both

pavement removal and the practice that replaces the pavement (e.g. pavers, conservation landscape, etc.).

Pavement Removal minimum requirements:

Best Management Practice (BMP)	Lot Size/Type	Drainage Area (ft^2)	Volume (ft^3)	Other Conditions	Eligible for Credit and Reimbursement?	Reimbursement Cap
Pavement Removal	Condominium or Townhouse	250	n/a	Must return area to a natural planted state, or cover with permeable hardscaping (must meet criteria in permeable hardscaping section); minimum removal of 100 ft^2	Yes	$600-$1,200
	Single Family Home on ¼ Acre or Less	500				
	Single Family Home on Greater Than ¼ Acre	1000				

What does this mean for me?

Let's say you live in a single-family home on 0.2 acres (less than ¼ acre). You removed your 500 square foot patio and replaced it with a conservation landscape. You chose to be reimbursed for the cost of hiring a contractor to remove the patio, rather than the conservation landscape. You saved receipts, took pictures before, during, and after your project. You paid $800 to have the patio removed; we would reimburse you $400 . You will also receive a credit for the hard surface you removed.

Permeable Hardscapes:

Permeable hardscapes are a more environmentally-friendly option for driveways and sidewalks in comparison to traditional pavement options, such as asphalt or concrete. Permeable hardscapes help runoff to gradually re-enter the water table through several inches of gravel below the surface and are carefully designed to prevent compaction. We do not recommend installing this practice on your own; please contact a certified professional if you are interested in this practice.

Permeable hardscapes are eligible for reimbursement of 50% of the cost incurred up to $1200. The installation of pavers must meet criteria defined in the Maryland Stormwater Design Manual, chapter 5 (2000). Permeable pavers must also meet the criteria below to be considered for reimbursement or credit.

Permeable Hardscapes minimum requirements:

Best Management Practice (BMP)	Lot Size/Type	Drainage Area (ft^2)	Volume (ft^3)	Other Conditions	Eligible for Credit and Reimbursement?	Reimbursement Cap
Permeable hardscaping	Condominium or Townhouse	250	19.79	Must have significant underground storage capacity. Minimum paved area of 100 ft^2.	Yes	$1,200
	Single Family Home on ¼ Acre or Less	500	39.58			
	Single Family Home on Greater Than ¼ Acre	1000	79.16			

What does this mean for me?

Let's say you live in a townhouse. You found a contractor from the list in Appendix D, or a search on the Interlocking Paver Institute contractor list. The contractor replaced your 250 square foot walkway (drainage area) with permeable pavers. You paid $2,000; we would reimburse you $1,000. You awill also receive a credit for the amount of hard surface you replaced with pavers.

Dry Wells:

Dry wells are underground storage containers, often surrounded by gravel, that capture stormwater runoff from gutters and then gradually allow it to infiltrate into the ground water table.

Dry wells are eligible for reimbursement for 50% of the cost incurred up to $600. Only internal volume of the dry well (not the surrounding stone) will be considered toward the overall capacity. If the dry well is filled with stone, you must provide porosity of the stone.

Dry Well minimum requirements:

Best Management Practice (BMP)	Lot Size/Type	Drainage Area (ft^2)	Volume (ft^3)	Other Conditions	Eligible for Credit and Reimbursement?	Reimbursement Cap
Dry Well	Condominium or Townhouse	250	19.79	Demonstrate A or B Hydrologic Soil Groups or 0.52 inch per hour or higher infiltration rate within 50 feet of the proposed dry well site.	Yes	$600
	Single Family Home on ¼ Acre or Less	500	39.58			
	Single Family Home on Greater Than ¼ Acre	1000	79.16			

What does this mean for me?

Let's say you live in a single family home on 2 acres (greater than ¼ acre). Your roof is 4000 square feet; one of your four downspouts, or 1000 square feet of rooftop (drainage area), is directed into a drywell. The drywell is a cylinder 7 feet tall and 4 feet wide. So the volume that your dry well holds is 87.9 ft^3 of water; this meets the criteria You paid $1,000; we would reimburse you $500 against the Fee. See Appendix B for more help.

Tree Canopy Expansion:

Trees are an effective way to help improve water quality while providing wildlife habitat.

Your tree planting must meet the requirements below to be eligible for credit and reimbursement of up to 50% of the cost incurred up to $600.

Best Management Practice (BMP)	Lot Size/Type	Drainage Area (ft^2)	# of Trees	Other Conditions	Eligible for Credit and Reimbursement?	Reimbursement Cap
Tree Canopy Expansion	Condominium or Townhouse	250	2	• Deciduous: minimum 2 inch caliper; Evergreen: minimum 6 feet tall. • Must provide water quality treatment benefit. • Species must not be invasive. Appropriate species can be found in Appendix D.	Yes	50% of the total cost not to exceed $150 per tree; maximum of $600 total
	Single Family Home on ¼ Acre or Less	500	4			
	Single Family Home on Greater Than ¼ Acre	1000	8			

What does this mean for me?

Let's say you live in a single family home on 0.15 acres (less than ¼ acre). Stormwater runoff from your 500 square foot patio (drainage area) slopes toward 4 red maples, each 2 inches in caliper, which you recently planted. You found the trees using the Green Registry referenced in Appendix E. You spent $450 on the trees; we would reimburse 50% of that, or $225.

Green Roofs:

Green roofs are vegetated roofs with soil amendment that help to treat runoff at its source. Green roofs also help to improve air quality.

If you are interested in installing a green roof, please speak with a professional. Green roofs must follow all guidelines offered in the Maryland Stormwater Design Manual, chapter 5. The maximum reimbursement for this practice is $1200, with a minimum green roof area of 300 square feet or ¼ of the roof.

Best Management Practice (BMP)	Lot Size/Type	Drainage Area (ft^2)	Volume (ft^3)	Other Conditions	Eligible for Credit and Reimbursement?	Reimbursement Cap
Green roof	Condominium or Townhouse Single Family Home on ¼ Acre or Less Single Family Home on Greater Than ¼ Acre	300 or ¼ roof	n/a	Must be installed by certified contractor and comply with Maryland Department of Environment Stormwater Design Manual, chapter 5 (2000)	Yes	$1,200

What does this mean for me?

You spent $9,000 on a green roof installed by a certified contractor; we would award you the $1,200 maximum reimbursement.

Appendix A: Definition of Terms:

Berm: A mound at the edge of a rain garden which detains rain water within the ponding area for infiltration.

Impervious Surface: A hard or compacted surface which stormwater runoff cannot percolate into. Some examples of impervious surfaces include: traditional rooftops, driveways, and sidewalks.

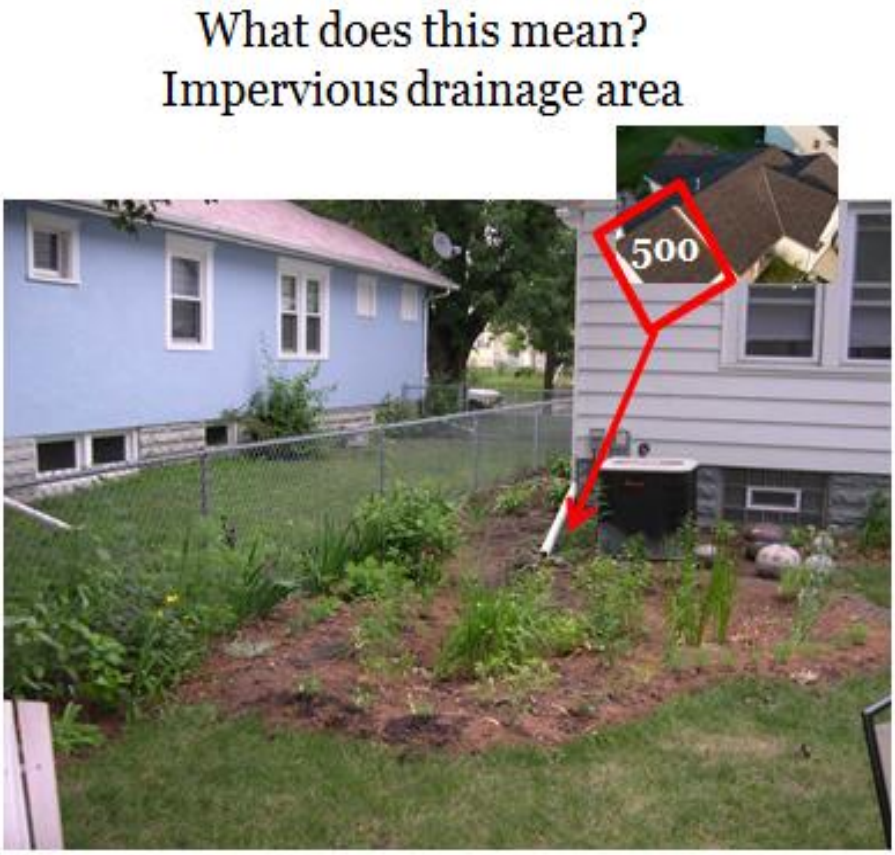
Ponding Area: The concave temporary storage area located interior to the pre-treatment area and berm of the rain garden

Ponding Depth: The depth of the ponding area, measured from the lowest point of the ponding area to the top of the berm.

Stormwater Best Management Practice (BMP): A practice, such as a rain garden, which improves water quality, often by removing sediment and excess nutrients.

Watershed Protection Fee (WPF): Howard County, Maryland's stormwater remediation fee. The WPF is included as a line item in the County's property tax bill.

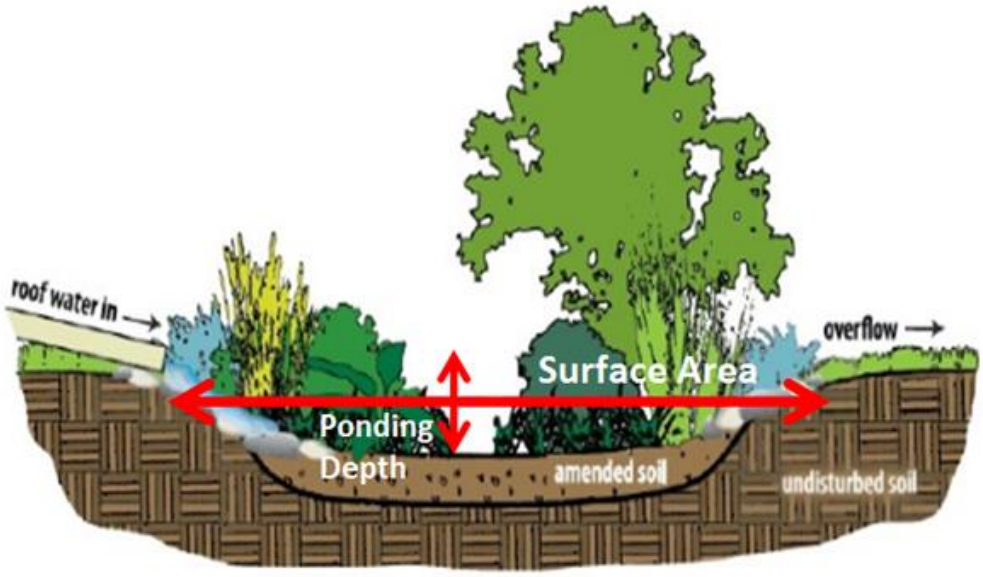
Appendix B: Drainage Area and Capacity Calculations:



We aim to manage the first 1 inch of rain fall with storm water practices. The first inch of rain, or “first flush,” is where the majority of pollutants come off of a hard surface. During the first inch of rainfall, 500 square feet will generate 29.96 cubic feet of water. The drainage area requirements that you see throughout this guide refer to the minimum square footage from an impervious surface, like the roof in the picture above, that must be directed to a practice, like the rain garden pictured. The rain garden or other practice must be sized to treat the impervious drainage area directed to it. The

impervious drainage area that you treat using your practice can be any hard surface on your property, including: rooftop, driveway, sidewalk, patio, or deck.

How to calculate volume for your practice: rain gardens



Graphic: EMSWCD

- Surface area: 125 square feet
- Ponding depth: 4 inches
- Capacity: 125 square feet*4 inches= 41.66 CF ☑

To calculate the volume of water that a rain garden can temporarily hold, multiply the ponding depth (the average distance from the mulch at the bottom of the rain garden to

the top of the berm) by the surface area (the approximate length times width). The rain garden must be able to drain this amount of water within 24-48 hours.

How to calculate volume for your practice: rain barrels and dry wells

Drainage area is determined in the same way for all practices (see above), but the volume of these items is based upon their shape. Note that the volumes required are also higher for these practices than for a rain garden. If you purchase them in a store (see Appendix D), these items will often display the volume that they can hold, making the information below unnecessary.

Volume of a cylinder: $\pi r^2 h$

Volume of pictured* rain barrel: $\pi x 2^2 x 3 = 37.68\ ft^3$

1 cubic foot=7.48 gallons, so $37.68\ ft^3$=**281.86 gallons**

*Not to scale

Appendix C: Resources Available to Help You:

Take a look at the attachment below for a summary of resources to help you before, during, and after installation of a stormwater project. Linked in the document are:

- Materials (and where to find them locally) for your stormwater project
- Do-It-Yourself guide for stormwater projects
- Local Contractor list

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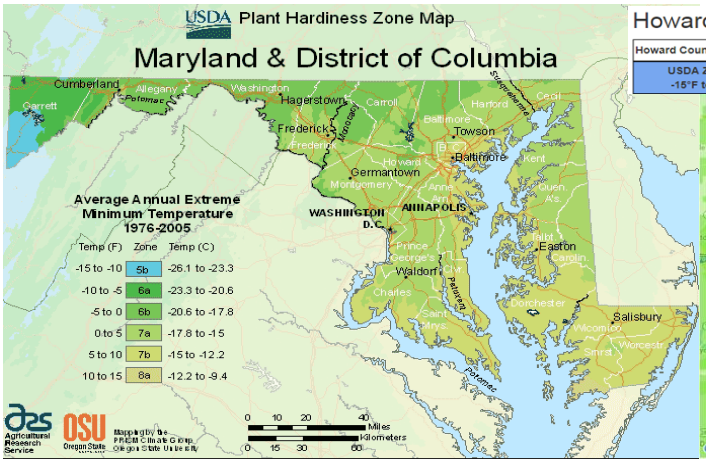
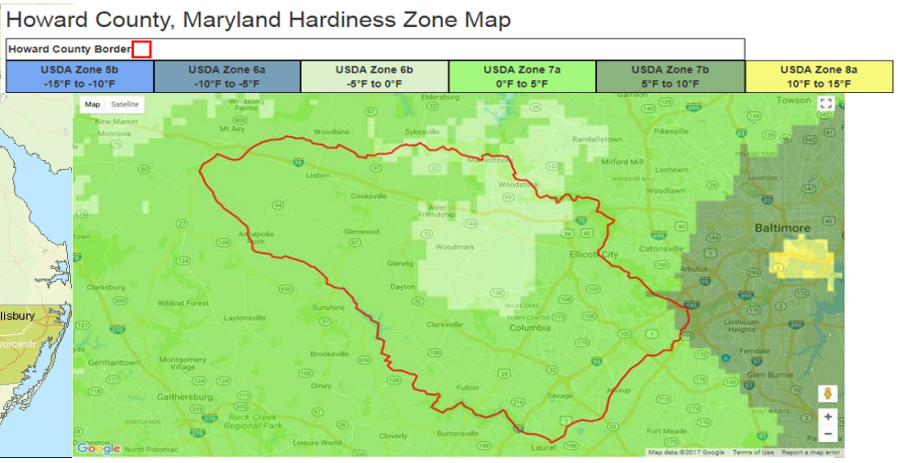
Appendix D: Appropriate Tree Species

Use the definitions below and the accompanying chart to select the appropriate species for your site. Howard County is in Hardiness Zones 6b, 7a and 7b.





Definitions Used in Chart 1

Hardiness Zone – This is the acceptable Hardiness Zone that the tree is capable of growing in. Hardiness Zones are determined by the average minimum temperature of a given location. A higher Hardiness Zone means a warmer climate is needed to sustain a healthy specimen. Data are based on the USDA Plant Hardiness Zone Map.

Soil Moisture – Four subheadings indicate the amount of moisture that is required for a plant to survive. Many plants have the ability to survive in many different levels of soil moisture. Note that it is critical to give newly transplanted trees several years of supplemental watering to hasten their establishment before expecting them to possess wider soil moisture level tolerance.

Sun Exposure – **Full sun** plants require more than 6 hours of direct sunlight a day, **partial shade** plants tolerate direct sun for less than 6 hours a day or filtered light for most of the day, and **full shade** plants tolerate little or no direct sunlight or less than 6 hours of filtered sunlight a day.

Soil Components – Each soil type has a certain proportion of sand, loam, and clay. Soils with a high proportion of sand generally hold little water due to sand's large particle size around which water passes. Soils with a high proportion of clay are relatively impermeable. The tolerance ratings in this section provide general characteristics of the soil needed by a particular tree species.

Drought Tolerance – This is the plant's ability to survive a single period of very little rainfall. Some plants are able to do this despite having unusually moist soil requirements.

Flood Tolerance – Tolerant trees can survive when flooded for 30 to 40 percent of the growing season, medium trees can survive when flooded for 10 to 30 percent of the growing season, and intolerant trees will not survive if flooded for more than 10 percent of the growing season.

Pest/Disease Tolerance – This field notes the relative susceptibility of tree species to pest/disease problems.

Soil Compaction – Compacted soil inhibits root growth. Some trees are able to grow in compacted soils, nonetheless, which would prove beneficial when planting trees on degraded sites.

Salt Tolerance – This refers to soil salinity, not aerosol salt. Soil tolerance is a consideration in those areas where road salt is used to de-ice the roads during the winter months.

pH level – Trees that require acid soil are listed as 5.0 – 6.8. Trees that require neutral soil are listed as 6.8 – 7.2. Trees that require alkaline soil are listed as 7.2 – 8.0.

Parts of Chart 1 are marked with shaded boxes according to the following legend:

T	= tolerant
M	= moderately tolerant
I	= intolerant
	= unknown

Chart 1. Tree Tolerance to Environmental Conditions

Common Name	Scientific Name	Hardiness Zone	Soil Moisture				Sun Exposure			Soil Components			Drought Tolerance	Flood Tolerance	Pest/ Disease Tolerance	Soil Compaction	Salt Tolerance	pH level
			Saturated or wet	Moist, well drained	Periods of dry	Prolonged drought	Full Sun	Partial Sun	Full Shade	Sand	Clay	Loam						
American basswood	*Tilia americana*	3 to 8	M	T	T	I	T	M	I	T	T	T	I	I	M	I	I	7.2 - 8.0
American beech	*Fagus grandifolia*	3 to 8	I	T	T	M	T	T	M	T	T	T	T	I	T	I	I	5.0 - 6.8
American elder	*Sambucus canadensis*	4 to 10	M	T	M	I	T	T	I	T	T	T	M	T	T	I	I	5.0 - 6.8
American elm (hybrids)	*Ulmus* hybrids	4 to 6	T	T	T	T	T	I	I	T	T	T	T	M	T	M	M	7.2 - 8.0
American hazelnut	*Corylus americana*	4 to 9	I	T	M	I	T	M	I	T	I	T	M	I	T	I	I	5.0 - 6.8
American holly	*Ilex opaca*	5 to 6	M	T	M	I	T	T	T	T	T	T	T	M	T	T	T	5.0 - 6.8
American hophornbeam	*Ostrya virginiana*	3b to 9	I	T	M	I	T	M	I	T	M	T	I	I	T	T	I	5.0 - 6.8
American hornbeam	*Carpinus caroliniana*	3 to 9	M	T	M	I	T	T	M	T	M	T	M	T	T	I	I	6.8 - 7.2
American sycamore	*Platanus occidentalis*	3 to 9	T	T	M	I	T	I	I	M	M	T	T	T	M	T	I	5.0 - 6.8
Bald cypress	*Taxodium distichum*	5 to 10	T	T	T	I	T	I	I	T	T	T	M	T	T	T	M	6.8 - 7.2
Black cherry	*Prunus serotina*	3 to 9	I	T	M	I	T	I	I	T	M	T	M	I	M	I	T	6.8 - 7.2
Black tupelo	*Nyssa sylvatica*	4 to 9	T	T	T	M	T	I	I	M	M	T	M	M	T	I	M	5.0 - 6.8
Black walnut	*Juglans nigra*	5 to 8	I	T	T	T	T	T	I	T	I	T	T	M	I	M	T	6.8 - 7.2
Black willow	*Salix nigra*	3 to 5	T	T	I	I	T	I	I	M	T	T	I	T	I	T	M	6.8 - 7.2
Blackhaw	*Viburnum prunifolium*	3b	I	M	T	T	T	M	I	M	I	M	T	I	M	I	I	7.2 - 8.0
Boxelder	*Acer negundo*	3 to 9	T	T	T	I	T	I	I	T	T	T	T	T	I	T	I	5.0 - 6.8
Bur oak	*Quercus macrocarpa*	3 to 8	T	T	T	T	T	I	I	T	T	T	T	M	I	I	T	7.2 - 8.0
Butternut hickory	*Carya cordiformis*	4 to 9	T	T	T	I	T	T	I	T	M	T	I	M	I	M	I	6.8 - 7.2
Buttonbush	*Cephalanthus occidentalis*	5 to 9	T	T	M	I	T	T	M	T	M	T	M	T	M		M	6.8 - 7.2
Canada hemlock	*Tsuga canadensis*	3b to 7	I	T	M	I	M	T	T	T	I	T	I	I	I	I	I	6.8 - 7.2
Chestnut oak	*Quercus prinus*	4 to 8	I	T	T	I	T	M	I	M	I	T	M	T	M			6.8 - 7.2
Common chokeberry	*Prunus virginiana*	2 to 6	I	T	T	M	T	M	I	T	I	T	M	I	I	I	T	6.8 - 7.2

Chart 1. Tree Tolerance to Environmental Conditions - *continued*

Common Name	Scientific Name	Hardiness Zone	Soil Moisture				Sun Exposure			Soil Components			Drought Tolerance	Flood Tolerance	Pest/ Disease Tolerance	Soil Compaction	Salt Tolerance	pH level
			Saturated or wet	Moist, well drained	Periods of dry	Prolonged drought	Full Sun	Partial Sun	Full Shade	Sand	Clay	Loam						
Common hackberry	*Celtis occidentalis*	3 to 9	I	T	T	I	T	M	I	T	I	T	I	M	I	M	T	7.2 - 8.0
Common spicebush	*Lindera benzoin*	4 to 9	I	T	M	I	T	T	I	T	M	T	I	T	T			7.2 - 8.0
Crabapple	*Malus* spp.	3 to 8	I	T	M	M	T	M	I	T	M	T	M	M	I		M	6.8 - 7.2
Crimeon linden	*Tilia euchlora*	3 to 7	I	T	T	I	T	I	I	T	I	T	M		M		I	7.2 - 8.0
Douglas fir	*Pseudotsuga menziesii*	4 to 6	I	T	T	I	T	M	I	M	M	T	I	M	I		I	6.8 - 7.2
Eastern cottonwood	*Populus deltoides*	3 to 9	T	T	T	T	T	M	I	T	T	T	T	T	I	T	T	6.8 - 7.2
Eastern hemlock	*Tsuga canadensis*	3b to 7	I	T	T	I	M	T	T	T	M	T	I	I	I	I	I	5.0 - 6.8
Eastern hophornbeam	*Ostrya virginiana*	3b to 9	I	T	T	I	T	M	I	T	I	T	I	I	T	I	I	7.2 - 8.0
Eastern larch	*Larix laricina*	2 to 4	M	T	T	M	T	M	I	M	M	T	T	M	I	T	T	5.0 - 6.8
Eastern redbud	*Cercis canadensis*	4 to 9	I	T	T	I	T	M	M	T	I	T	I	M	T	M	M	6.8 - 7.2
Eastern redcedar	*Juniperus virginiana*	3b to 9	I	T	T	T	T	M	I	T	M	T	T	I	M	I	T	7.2 - 8.0
Eastern white pine	*Pinus strobus*	3 to 7	M	T	T	I	T	M	I	T	M	M	M	I	I	I	I	5.0 - 6.8
Elderberry	*Sambucus canadensis*	4 to 9	M	T	M	I	T	T	I	M	M	T	I	T	I			6.8 - 7.2
Flowering dogwood	*Cornus florida*	5	I	T	T	I	M	T	T	T	I	T	M	T	I		I	6.8 - 7.2
Fringetree	*Chionanthus virginicus*	4 to 9	I	T	T	I	T	T	M	T	M	T	I	I	T	I	I	5.0 - 6.8
Ginkgo	*Ginkgo biloba* (male only)	4 to 8	I	T	T	T	T	M	I	T	I	T	M	T	T		T	6.8 - 7.2
Golden rain tree	*Koelreuteria paniculata*	5	M	T	T	T	T	M	I	T	M	T	T		T		T	7.2 - 8.0
Gray birch	*Betula populifolia*	3 to 6	M	T	T	I	T	I	I	T	T	T	M	T	I	M	T	6.8 - 7.2
Green ash	*Fraxinus pennsylvanica*	4 to 9	M	T	T	I	T	M	I	T	M	T	M	T	I	T	M	6.8 - 7.2
Hawthorn	*Crataegus viridis*	4 to 7	M	T	T	T	T	I	I	T	M	T	T	M	I	T	M	7.2 - 8.0
Hazel alder	*Alnus serrulata*	5 to 9	T	T	M	I	T	I	I	T	T	T	I	T	T	T	I	6.8 - 7.2

Chart 1. Tree Tolerance to Environmental Conditions - *continued*

Common Name	Scientific Name	Hardiness Zone	Soil Moisture				Sun Exposure			Soil Components			Drought Tolerance	Flood Tolerance	Pest/ Disease Tolerance	Soil Compaction	Salt Tolerance	pH level
			Saturated or wet	Moist, well drained	Periods of dry	Prolonged drought	Full Sun	Partial Sun	Full Shade	Sand	Clay	Loam						
Hedge maple	*Acer campestre*	5 to 8	I	T	T	T	T	T	I	T	M	T	T		T	T	M	7.2 - 8.0
Highbush cranberry	*Viburnum trilobum*	2 to 7	I	T	M	I	T	T	I	M	M	T	M	T	M	T	M	5.0 - 6.8
Honeylocust	*Gleditsia triacanthos inermis*	4 to 9	I	T	T	T	T	M	I	M	M	T	T	M	I	T	T	7.2 - 8.0
Horsechestnut	*Aesculus x carnea*	5a	I	T	T	I	T	M	I		M	T	M		I	M	M	7.2 - 8.0
Laurel oak	*Quercus laurifolia*	6 to 9	T	T	T	I	T	T	I	T	M	T	M		T	T	I	6.8 - 7.2
Littleleaf linden	*Tilia cordata*	3b to 7	I	T	T	I	T	M	I	T	I	T	M	T	I	M	I	7.2 - 8.0
Loblolly pine	*Pinus taeda*	6 to 9	M	T	T	I	T	I	I	T	M	T	M	M	M	T	I	5.0 - 6.8
Mountain ash	*Sorbus* cultivars	4 to 6	I	T	T	I	T	I	I	T	I	T	I	M	I	M		5.0 - 6.8
Mountain-laurel	*Kalmia latifolia*	4 to 9	I	T	M	I	M	T	M	T	M	T	I	I	I			5.0 - 6.8
Northern red oak	*Quercus rubra*	3b to 7	I	T	T	M	T	M	I	T	I	T	M	T	I	T	T	7.2 - 8.0
Nuttall oak	*Quercus nuttallii*	5 to 9	M	T	T	M	T	M	I	M	M	T	M	T	T	T	M	5.0 - 6.8
Overcup oak	*Quercus lyrata*	5 to 9	T	T	T	M	T	T	I	T	T	T	T	T	T	T		5.0 - 6.8
Paperbark birch	*Betula papyrifera*	2 to 6	M	T	T	I	T	M	I	T	M	T	I	I	M	I	T	5.0 - 6.8
Pawpaw	*Asimina triloba*	5 to 8	I	T	M	I	T	T	M	T	I	T	I	I	T	I	M	6.8 - 7.2
Persimmon	*Diospyros virginiana*	4 to 9	I	T	T	M	T	T	M	T	I	M	T	M	M	M	M	5.0 - 6.8
Pin oak	*Quercus palustris*	6 to 9	T	T	T	M	T	I	I	T	T	T	M		M	T	M	5.0 - 6.8
Pond cypress	*Taxodium ascendens*	5 to 9	T	T	T	M	T	T	T	T	T	T	M	T	M		M	5.0 - 6.8
Red (slippery) elm	*Ulmus rubra*	3 to 9	M	T	T	M	T	T	T	T	M	T	M	T	T	T		6.8 - 7.2
Red maple	*Acer rubrum*	3b to 9	T	T	T	I	T	T	M	T	T	T	I	T	I	T	I	5.0 - 6.8

Chart 1. Tree Tolerance to Environmental Conditions - *continued*

Common Name	Scientific Name	Hardiness Zone	Soil Moisture				Sun Exposure			Soil Components			Drought Tolerance	Flood Tolerance	Pest/ Disease Tolerance	Soil Compaction	Salt Tolerance	pH level
			Saturated or wet	Moist, well drained	Periods of dry	Prolonged drought	Full Sun	Partial Sun	Full Shade	Sand	Clay	Loam						
Red-osier dogwood	*Cornus sericea*	2 to 7	T	T	M	I	T	T	I	M	T	T	M	T	M	T	I	6.8 - 7.2
River birch	*Betula nigra*	3b to 9	T	T	T	I	T	M	I	T	T	T	I	M	M	T	I	5.0 - 6.8
Sassafras	*Sassafras albidum*	4 to 9	I	T	T	T	T	T	I	T	I	T	T	I	T	T	M	5.0 - 6.8
Scarlet oak	*Quercus coccinea*	4 to 9	I	T	T	T	T	M	I	T	I	M	T	I	T	I	M	5.0 - 6.8
Serviceberry	*Amelanchier arborea*	4 to 9	I	T	T	I	T	T	M	T	I	T	I	I	T	I	I	6.8 - 7.2
Shagbark hickory	*Carya ovata*	4 to 8	M	T	T	T	T	T	M	T	M	T	T	I	T	M	I	5.0 - 6.8
Shingle oak	*Quercus imbricaria*	4 to 8	I	T	T	M	T	M	I	T	M	T	M	M	T	M	M	5.0 - 6.8
Shumard oak	*Quercus shumardii*	5 to 9	M	T	T	M	T	M	I	T	I	T	M		T	T	M	7.2 - 8.0
Silky dogwood	*Cornus amomum*	4 to 8	T	T	T	M	M	T	M	T	I	T	M	T	T	T	I	5.0 - 6.8
Silver linden	*Tilia tomentosa*	4 to 7	I	T	T	I	T	M	I	T	I	T		T		M	M	7.2 - 8.0
Silver maple	*Acer saccharinum*	3 to 9	T	T	T	I	T	M	I	T	T	T	I	T	I	T	M	5.0 - 6.8
Smooth sumac	*Rhus glabra*	3 to 9	I	M	T	T	T	M	I	T	M	T	T	T	T	I	T	6.8 - 7.2
Sourwood	*Oxydendrum arboreum*	5	I	T	T	I	T	T	M	T	I	T	M	I	T	I	M	6.8 - 7.2
Sugar maple	*Acer saccharum*	4 to 8	I	T	T	I	T	T	M	T	I	T	I	I	I	I	I	6.8 - 7.2
Sugarberry	*Celtis laevigata*	5 to 9	M	T	T	I	T	M	I	T	M	T	M	T	M	T	T	6.8 - 7.2
Swamp chestnut oak	*Quercus michauxii*	5 to 8	M	T	M	I	T	M	M	M	M	T	I	M	M	T		5.0 - 6.8
Swamp white oak	*Quercus bicolor*	4 to 8	M	T	T	I	T	T		M	T	T	I	M	T	T		6.8 - 7.2
Sweet-bay magnolia	*Magnolia virginiana*	5 to 9	T	T	M	I	T	T	M	T	T	T	I	T	T	T		5.0 - 6.8
Sweetgum	*Liquidambar styraciflua*	5 to 9	M	T	T	I	T	M	I	T	T	T	I	T	T	T	M	6.8 - 7.2
Tulip tree	*Liriodendron tulipifera*	4 to 9	M	T	T	I	T	T	M	T	M	T	I	I	T	I	I	5.0 - 6.8
Water hickory	*Carya aquatica*	5 to 9	T	T	T	I	T	T	I	T	M	T	M	T	T	T	I	6.8 - 7.2
White ash	*Fraxinus americana*	4 to 9	M	T	T	I	T	T	M	T	M	T	I	M	I	M	M	6.8 - 7.2
White oak	*Quercus alba*	3b to 9	I	T	T	I	T	T	M	T	T	T	M	I	I	I	T	5.0 - 6.8
Willow oak	*Quercus phellos*	5 to 9	M	T	T	T	T	T	M	T	T	T	T	M	I	T	I	6.8 - 7.2
Winterberry	*Illex verticillata*	3 to 5	T	T	T	I	T	T	M	T	T	T	M	I	M	T	I	5.0 - 6.8
Witch hazel	*Hammamelis virginiana*	3b to 8	I	T	T	I	I	M	T	M	M	T	I	I	T	I	I	5.0 - 6.8

Appendix E: Other Considerations:

- Best Management Practices installed at development as part of new stormwater regulations are not eligible for credit or reimbursement (typically development 2003 and newer).
- Best Management Practices installed before November of 2011 are not eligible for reimbursement.
- Current homeowner must have installed practice to be considered for reimbursement and appropriate receipts must be provided.
- The Howard County Office of Community Sustainability retains the right to reject any BMP for credit, if it does not provide a water quality treatment benefit.
- All contractors who have not installed at least 5 reimbursed and/or credited BMPs in Howard County must submit planting plans, calculations, and profile views of their BMP designs at the time of their client's application.
- All credit applications received after April 4, 2016 will receive a percentage of credit based upon the amount of total impervious surface treated on site.

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with any questions related to this material.