



RESIDENTIAL RAIN GARDEN CALCULATION WORKSHEET

Property Owner: _____

Site Address: _____ Zone: _____

Step 1. Calculate the treatment volume

The treatment volume (b) is twice the volume of 1.1 inches of rain multiplied by the additional impervious surface area calculated in the impervious surface calculation worksheet. This is the volume you are required to capture in the rain garden (below the raingarden overflow) and infiltrate into the ground. This volume of runoff can be routed to the raingarden from any on-site impervious surface.

	Item	Total
(a)	Area of impervious surfaces requiring mitigation (square feet)	
(b)	Treatment volume (cubic feet)	

(a) from impervious surface calculation worksheet

(b) = $[2 \times (a) \times 1.1/12]$

Step 2. Determine the area and depth of your rain garden

The treatment volume calculated above in (b) will determine the area and depth of your rain garden. The rain garden ponding depth is also dependent on how fast water can infiltrate into the ground. The entire volume of water captured in your rain garden must infiltrate into the ground within 24 hours and the ponding depth may not exceed 8 inches.

	Item	Total
(c)	Infiltration rate of on-site soils beneath rain garden (inches/hour)	
(d)	Ponding depth (inches) or 8", whichever is less	
(e)	Surface area of <u>bottom</u> of rain garden (square feet)	

(c) = infiltration test rate (preferred) or design rate from Appendix A

(d) = $24 \text{ hrs} \times (c)$

(e) = $[(b) / (d)] \times 12$

Additional information

Rain Garden Manual <http://dnr.wi.gov/topic/stormwater/documents/rgmanual.pdf>

MN Stormwater Manual https://stormwater.pca.state.mn.us/index.php/Main_Page

Plants for Stormwater Design <https://www.pca.state.mn.us/water/plants-stormwater-design>

Calculated by: _____

Date: _____

Staff Approval by: _____

Date: _____

Appendix A. Design Soil Infiltration Rates

Hydrologic soil group	Infiltration rate (inches/hour)	Infiltration rate (centimeters/hour)	Soil textures	Corresponding Unified Soil Classification
A	1.63 ^a	4.14	gravel sandy gravel silty gravels	GW - well-graded gravels, sandy gravels GP - gap-graded or uniform gravels, sandy gravels GM - silty gravels, silty sandy gravels SW - well-graded gravelly sands
	0.8	2.03	sand loamy sand sandy loam	SP - gap-graded or uniform sands, gravelly sands
B	0.45	1.14		SM - silty sands, silty gravelly sands
	0.3	0.76	loam, silt loam	MH - micaceous silts, diatomaceous silts, volcanic ash
C	0.2	0.51	Sandy clay loam	ML - silts, very fine sands, silty or clayey fine sands
D	0.06	0.15	clay loam silty clay loam sandy clay silty clay clay	GC - clayey gravels, clayey sandy gravels SC - clayey sands, clayey gravelly sands CL - low plasticity clays, sandy or silty clays OL - organic silts and clays of low plasticity CH - highly plastic clays and sandy clays OH - organic silts and clays of high plasticity

Source: Minnesota Stormwater Manual, 2016

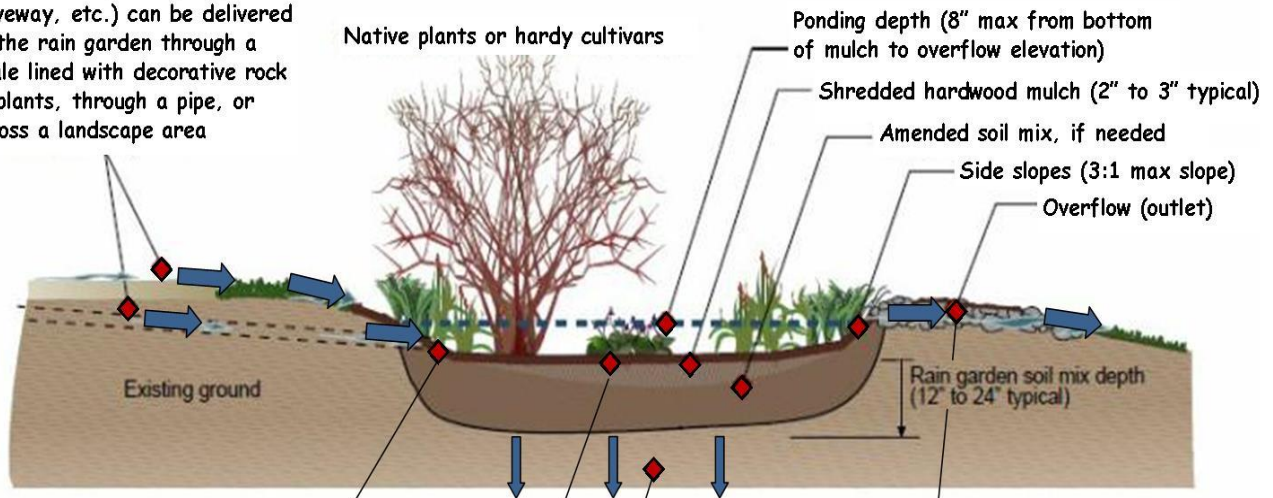
Infiltration Test Procedure

1. Dig a hole approximately 8 inches in diameter and 8" deep in the proposed rain garden area, preferably starting at the bottom elevation of the proposed rain garden.
2. Fill hole to the top with water and let water soak into the soil for at least two hours in order to saturate the soil.
3. Refill the hole with water until it reaches about one inch from the top. Mark the starting level of the water with a toothpick or stick. Record the time.
4. Measure how far the water level drops for at least three known time intervals. If you have sandy soils, you might record the water level after 15 minutes, 30 minutes and 1 hour. If you have clay soils and the water level goes down slowly, you may have to record the water levels after one, two and four hours. The slowest infiltration rate you measure will be the design infiltration rate you use in the rain garden sizing calculation (c).

Source: Blue Thumb Guide to Raingardens.

Appendix B. Example Rain Garden Cross Section

Inlet: water flowing off impervious surfaces (roof, driveway, etc.) can be delivered to the rain garden through a swale lined with decorative rock or plants, through a pipe, or across a landscape area



For a piped inlet, install rocks at the end of the pipe to prevent erosion

Flat bottom

Till existing soil under the rain garden to a depth of 12" to 18" if compacted

Overflow (outlet): Excess water can be directed out of the rain garden overland or through a pipe. An overland outlet should be covered with rocks or plants to prevent erosion.