

Build it and Clean Water will Come!

A Rain Garden Guide for Homeowners

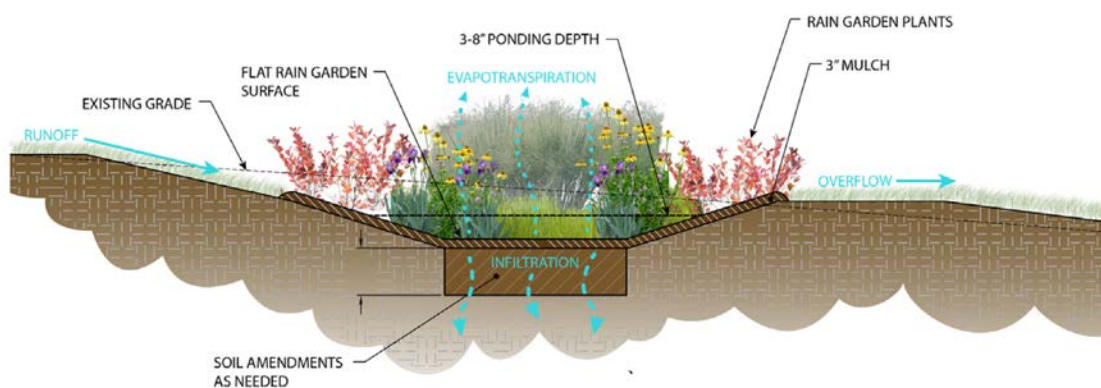
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Michelle is a senior water resources engineer with more than 18 years of professional experience. With a background in both engineering and natural resources, she is passionate about using her skills to restore the natural world while improving the human experience.

Have you joined the rain garden craze yet? Inspired by an article, your neighbor's rain garden, or our Rain Garden Wednesdays on Instagram? Want to do your part to improve your local water quality and wildlife habitat? It's easier than you think!

What is a Rain Garden?

Rain gardens are actually very simple. They are just shallow depressions – too shallow to even call a hole! – with plants. But, rain gardens are not just isolated depressions placed randomly out in a yard. They are specifically sized and placed to absorb **stormwater runoff**, the water that flows from your built **impervious surfaces** such as rooftops, driveways, roads, parking lots, and even compacted lawn areas when it rains. And that's it! Well, not quite, since rain gardens do take a bit of planning and physical labor, which we will get to in a bit.

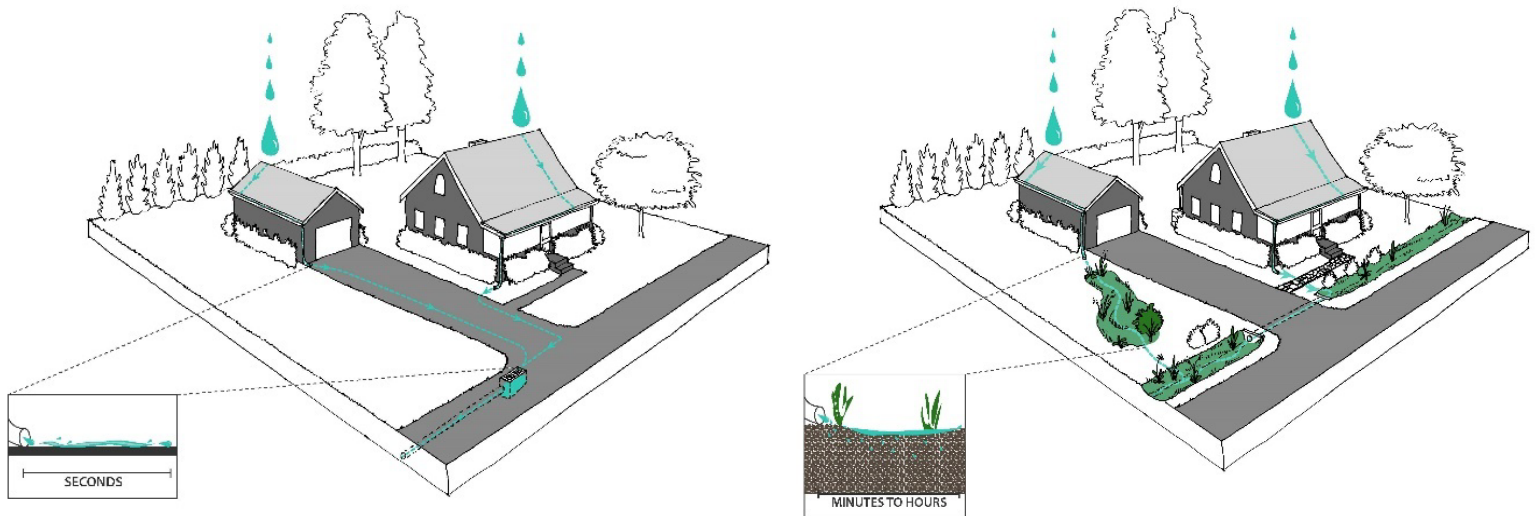


Cross-section of a typical rain garden

Maybe the better question to ask is “why a rain garden”? What’s so bad about stormwater runoff? Why all the fuss? It’s just rainwater straight from the sky – isn’t that natural? Unfortunately, no. All of those impervious surfaces that we built for our shelter and transportation prevent the clean rainwater from soaking into the ground like it did before we developed the land. Dirt, fertilizer, soaps, oils, metals, and even animal poop build up on these hard surfaces and get carried away with the stormwater. In addition to creating water pollution, when your runoff joins up with your neighborhood’s runoff, it can cause flooding and erosion, damage infrastructure, degrade aquatic ecosystems, and close shellfishing areas and beaches. While runoff from just your home or business may not cause much of a problem, the **cumulative impact** from everyone’s home and business really does.

Rain gardens are one beautiful way to **“break the impervious chain”** of roof to downspout to driveway to road to stream, pond, or bay. They use soils and plants to filter pollutants and help water soak in rather than run off. Please remember that rain gardens are NOT ponds or wetlands - they should drain in less than 24 hours after a rainfall. Use the four-step process below to create one at your house!

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These graphics show how “breaking the impervious chain” slows, cleans, and reduces the stormwater leaving a site.

Step 1 – Site Selection

This step really is the most important. Choosing the wrong location for your rain garden can at best, waste your time and money, and at worst, cause drainage issues in your yard. So, take your time with Step 1!

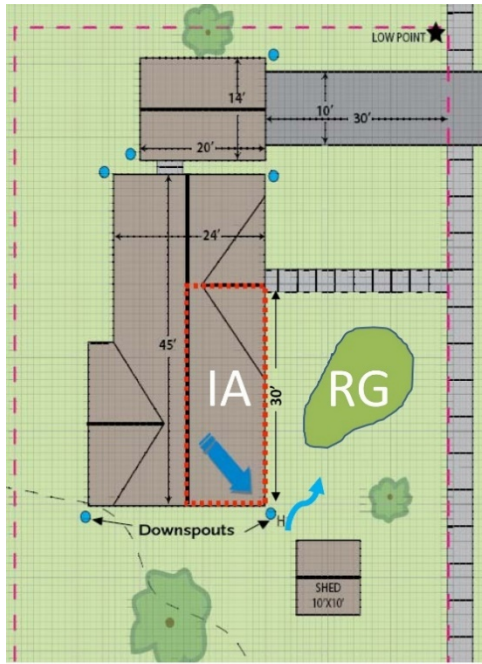
- 💧 Walk your property to get the general lay of the land.
- 💧 Where does the water go? Determine existing stormwater flow paths.
- 💧 Note the location of underground pipes, trees, structures, property lines, septic systems, etc.
- 💧 What kind of soils do you have? (e.g., sand, clay, etc.) Areas of well-drained sand are ideal but not mandatory.
- 💧 Pick a good general location for your rain garden. Try to avoid areas that:
 - ✗ Are within 10 ft of a wall or basement, 2 ft of a sidewalk/driveway; and 50 ft of a septic system
 - ✗ Stay consistently wet
 - ✗ Have high groundwater or bedrock
 - ✗ Are under trees or on steep slopes or where getting water into and out of the rain garden is difficult.

Helpful Tip - Existing flat areas are the best, at least on your shoulders and back if you are digging it by hand!

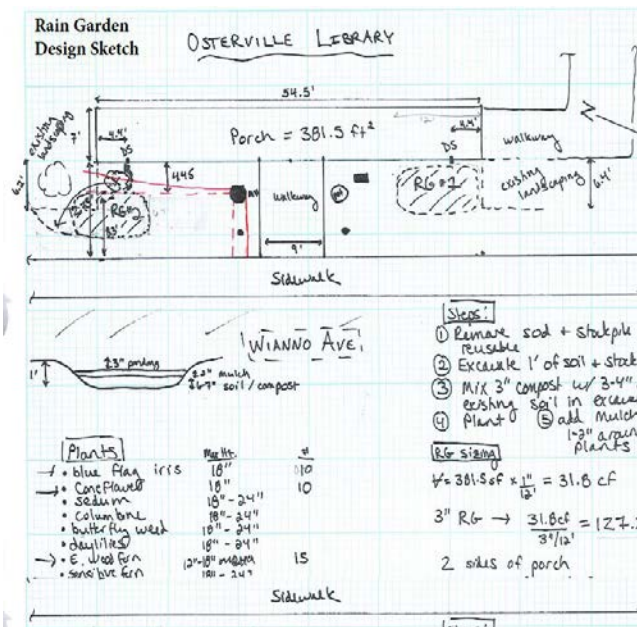
Step 2 - Design

Now that you have a general location, you can get to the fun part – designing your rain garden! You do not need to be an engineer to complete this step, I promise (although I understand how hollow that sounds coming from an engineer...)! While it is important to understand roughly how big your rain garden should be, this does not have to be an exact calculation - there is a lot of wiggle room here. Most importantly, have fun with the shape and look of your rain garden!

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*Example plan showing rain garden (RG) that captures runoff from a portion of roof (IA)



Don't be afraid to make a sketch! You don't need to be an artist to jot down a meaningful sketch that helps you visualize your yard and find a great place for your rain garden.

- Estimate **impervious areas (IA)** draining to your rain garden. This is the size (ft²) of your rooftops, driveways, patios, etc., that are uphill from your rain garden. So it may just be a portion of your roof or half of your driveway, while the other half drains to the other side of your yard. Don't over count!
- Size the **rain garden (RG)** surface area to hold at least **1 inch of rain (P=0.08 ft)**. One inch is a good target to shoot for since 90% of all storm events in the Northeast are 1 inch or less, causing the majority of all stormwater pollution. Typical rain gardens are 100-200 ft².
- Choose a **ponding depth (D)**. This is not a depth of permanent standing water, but instead, the maximum depth of water during and immediately after a rain event. Typical rain gardens are **6 inches deep (D=0.5 ft)** - you can go deeper for sandy soils (up to 8"), whereas tight soils (with a lot of silt or clay) require a larger surface area with shallower depths (minimum 3").

Now wait, you say, this is starting to sound like math! But you promised! Never fear - you can use the **cheat sheet in Table 1** to figure out your rain garden surface area. Just pick your ponding depth and size of impervious area, and we did the math for you! But if you love equations like I do, you can do your own calculations with the following equation:

$$RG \text{ (ft}^2\text{)} = \frac{IA \text{ (ft}^2\text{)} * P \text{ (ft)}}{D \text{ (ft)}}$$

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Table 1. Approximate Rain Garden Size (ft ²) to meet rainfall target of 1 inch			
Impervious Drainage Area	Ponding Depth		
	3" (.25 ft)	6" (.50 ft)	8" (.67 ft)
500 ft ²	170	85	65
750 ft ²	250	125	95
1000 ft ²	340	170	125
1500 ft ²	500	250	190
2000 ft ²	680	340	250

And that's it – now you know how big your rain garden needs to be! What's next?

- 💧 Amend soils if necessary to improve infiltration and provide organic matter for plants. Add a 3" layer of coarse sand for sites with clayey soils or 3" of leaf compost for really sandy sites.

Helpful Tip - For a 100 ft² rain garden, a 3" layer of amendments = 1 cubic yard

- 💧 Figure out how to get the water in your garden, and perhaps more importantly, how it will get out during really big storms. For inlets, consider using an extended downspout or pipe, vegetated or stone-lined swales, diversion berms, or just direct the surface flow over lawn. The key is to make sure you don't have erosion at the inlet location – use rock if you see erosion. For overflows, just make sure you know where the water will go if the rain garden overflows:
 - ✗ Avoid directing overflow to other properties or structures
 - ✓ Make berms higher near buildings
 - ✓ Direct flows over lawns or into existing drain inlets or wherever the stormwater goes today.

Helpful Tip - Remember, you are not creating more water than you had before – the drainage area is the same. Rather, you are actually reducing the total amount of runoff with your rain garden. So as long as you are not redirecting runoff in a completely different direction, the rain garden should be improving conditions, not creating new problems!

- 💧 Pick your plants!
 - ✓ Use plant species tolerant to both wet and dry conditions.
 - ✓ Native species are preferred and DO NOT plant invasive vegetation
 - ✗ Avoid using edible plants, particularly if treating driveway or road runoff
 - ✓ Provide for variable heights, color, leaf shape (trees, shrubs, herbaceous)
 - ✗ Avoid placing woody vegetation at inflow/outflow locations to avoid clogging
 - ✓ Consider visual appeal and wildlife habitat in all seasons (e.g., fall flowers for pollinators; winter berries for birds, etc.)

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But wait, which plants do I use? Don't worry if you are not a master gardener! You can usually ask at your local nursery or find a list online. There is probably a rain garden plant list for your location, but the recommended species are pretty similar throughout the Northeast, so don't worry if you can't find one for your specific area. Here are two example lists you can start with from UMASS and APCC:

<https://ag.umass.edu/landscape/fact-sheets/rain-gardens-way-to-improve-water-quality>

<https://apcc.org/raingardens/apcc-rain-garden-plant-list.pdf>

You can also find lists of invasive species to avoid in your area. Here is a sample list of the invasive species in Massachusetts:

<https://www.mass.gov/service-details/invasive-plants>

Step 3 – Install

Now that you've got your hand sketch of your rain garden location and design, it's time to get your hands dirty. Round up your friends and family, or even better, your neighbors (maybe they'll want one next!), to help you with the installation. Don't forget to do the following before you get started, though:

- 💧 Check with the Town or City to see if you need a permit and call for utility locations before you dig!
- 💧 Mark the excavation footprint with string or spray paint.



Spray-painted location of a rain garden – the solid line indicates bottom of bed and the dotted line is for the top of slope, leaving space to provide gentle side slopes rather than vertical walls.

- 💧 Install erosion & sediment controls if necessary (like silt fence or silt sock).
- 💧 Find a place to stockpile materials.
- 💧 Remove grass (reuse, if possible).

Helpful Tip – Use a tarp for stockpiling materials to make cleanup so much easier!

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Now, you are ready for the actual work!

- Start digging! Dig to the desired ponding depth (3-8") along with another 2-3" if you are adding a mulch layer. May also need to over-dig another 3-6" to aerate compacted soils or for adding soil amendments. Use excavated material to create berms if needed.
- Mix any amendments into the native soil with shovels and rakes.
- Be sure to make the bottom of ponding area flat. This is the most important part of the install. The rain garden should fill up uniformly like a bathtub.



Helpful Tip - You can check this easily at home using two stakes, a string, a string level, and a measuring tape!



- Install inlet and overflow components.
- Plant! Arrange plants first, then remove from containers. Loosen root-bound plants and dig holes 2x wider than the root ball. Leave room for mulch layer if adding. Plugs can go in after mulch.
- Add mulch/organic surface layer (1-3") or just around plants (preferred). Protect small plants.

Helpful Tip - Don't be afraid to "decorate" with rocks, particularly any you found while you were digging! Looks cool and saves you time and effort to get rid of them.



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- 💧 Turn on water to inspect flow path and to soak plants. If your inlet is a roof downspout, it is fun to spray water on your roof and watch the rain garden in action!
- 💧 Clean up site. Remove any erosion controls once area is stabilized (i.e., the plants and/or seed are well established!).
- 💧 Pat yourself on the back and enjoy your rain garden!

Table 2 – Sample rain garden supply list

Rain Garden Supply List	Qu	Unit	Notes
Materials			
Compost for 3 inches of soil amendments	1.5	cy	Mix compost with existing soil for bottom of RG
Mulch, 2 inches with extra for blending existing beds	1.5	cy	
Tarps for stockpiles	3-4	ea	
Plants	100	ea	See RG sketch for proposed layout
Washed stone for downspouts	1	cf	couple of bags should do
Non-woven filter fabric for use under the stone inlet and overflow – (roll 6’ wide)	6	sf	only need a pretty small strip
Fabric staples	1	box	
Grass seed for stabilizing disturbed areas outside of rain garden	1	bag	or re-use sod
Erosion controls (silt fence or silt sock)	50	ft	~30 ft for downgradient of RG and ~20 ft for around soil stockpile if needed
Spray paint for marking garden footprint	1	can	
Tools			
Gloves			String level
Tape measure			Hammer
Shovels (both spade and flat)			Trowel
Rake			Wheelbarrow
Pitchfork			Utility knife for cutting fabric
Stakes and string			Hose for watering

Step 4 – Maintain

Unfortunately, yes, your rain garden will need to be maintained like everything else. But the level of effort required is really based on how “nice” you want it to look. If you are going for the more wild, natural look, maintenance will be pretty minimal. If you want it to be a more ornamental feature in your yard, then you will need to keep up with it just like your other ornamental beds.

- 💧 Inspect your rain garden after storms and during regular landscaping activities. Be sure to look for:
 - ✗ Weeds and invasive plants
 - ✗ Sediment build-up
 - ✗ Debris and trash
 - ✗ Dying plants and grasses
 - ✗ Erosion/gullying
 - ✗ Inlet/outlet clogging
 - ✗ Standing water/drainage issues
- 💧 Maintenance activities will include:
 - ✓ Vegetation pruning and trimming
 - ✓ Debris and sediment removal
 - ✓ Plant and mulch replacement
 - ✓ Stabilization of any eroded areas with rock or plants
 - ✓ Soil amendments for areas that pond water >24 hours after rain
 - ✗ No fertilization is recommended

We hope this helps you put a rain garden in at your house! If you want to use a downloadable rain garden App on your smart phone or tablet, we recommend the one that our friends at the University of Connecticut developed: <http://nemo.uconn.edu/raingardens>

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