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I Hope It Rains This Weekend

The Raingarden Project

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I have been diverting the roof runoff in my yard to lush gardens for many years now, so the idea of using raingardens for stormwater treatment seemed reasonable, but there weren't a lot of local examples. So last year, the engineering company where I work (Comprehensive Environmental Inc. of Milford, MA) formed an in-house group called the "Low Impact Development Working Group" to explore raingardens and other techniques. The group got together to discuss what we could do to demonstrate LID techniques, and our first project was born.



The project involved building raingardens at employee homes mostly in Massachusetts and New Hampshire. Employees would provide labor; the company would pay the equipment and other expenses. Our goal was to use our engineering expertise to design raingardens that would satisfy the need for individual lot-by-lot techniques while also being cheap enough for the average homeowner to accomplish on their own, with simple maintenance and upkeep. We also wanted the gardens to depict a wide variety of mostly native plants in a variety of situations so that people could see these natives in action, and to test the gardens and plants over time to improve the design features for a variety of applications in the northeast climate.

The employees, a mix of engineers, environmental scientists, biologists and administrators, went about the raingarden project with zeal. Everyone created their own drawings, which ranged from sketches to scaled and surveyed AutoCAD drawings. Native plant catalogs and books were distributed, and everyone came up with their own plant list, design drawings and layout, with experienced gardeners helping those without experience in basic gardening. The plants ordered were quite small, mostly 2-4 inch pots except where slow growing shrubs or trees were used.

Design Issues

Most of the raingardens had similar media, 50% composted bark mulch mixed with 50% of the native soils, whatever those were, and topped with 2-3 inches of shredded bark mulch. One used free leaf compost from the local transfer station in her community.



We used this mix of organic materials with local soils instead of bringing in loam because that tends to bring in stubborn foreign perennial weeds. For compost, we used decayed bark mulch because it is commonly available in the New England area, usually as leftover, rotted, hemlock bark mulch that wasn't sold the previous year, or leaf compost, commonly a free product. Everyone calculated compost and bark mulch they needed, and chose how to provide a drainage layer. Each employee ordered the materials and waited for their turn with the backhoe. Employees with experience operating a backhoe were selected to assist those in their region that lacked this experience. Plants were ordered in bulk and divided up when they came in to the office.

The group felt it was important to tie the raingarden unit below the frost line to prevent freeze up which might occur during some winters that have particularly wet and freezing rain followed by heavy and deep frost. Initially, a stone reservoir was considered, as CEI often uses in commercial bio-filters, but that approach seemed too expensive for a typical homeowner. We needed a cheaper option. After more research, two designs were proposed: a 'rockbag' as used in the Maplewood, Minnesota DPW project; and a new design that one of our engineers came up with. The new design involves a column of stone with a slotted PVC pipe in the middle that would allow drainage down below the frost line. Employees could choose between the two designs for the drainage component, considering their local soils.

Drainage areas for the gardens varied widely, from a maximum size of one half acre of dirt driveway draining to a 12 X 20 garden to the smallest "compact" garden, only 3 X 5 in size draining a few hundred square feet of steep roof. All employees contacted their local public works officials to let them know that the raingarden was going to be going in and to get permission if it was in the right-of-way. DigSafe was also called to mark out utilities.

Eight basic raingarden types were built, including:

- 1) A four season raingarden with shrubs and perennials;
- 2) A wild flower garden;
- 3) A shrub garden;
- 4) A compact vertical garden near a trellis;
- 5) A moonlight garden in all white and other pale colors;
- 6) A native prairie garden;
- 7) A mixed perennial garden, and;
- 8) A daylily garden. The only non-natives are the daylilies which several employees chose for use on the upper edges of their gardens.

Each garden featured plants which could tolerate either wet or dry conditions in the middle of their raingarden, surrounding the high and dry edges with more drought tolerant species. In a few cases, employees found that they did not like a particular plant and quickly replaced it with other plants.

Lessons learned

The largest of the raingardens drained ½ acre of dirt road, and quickly began to accumulate too much sand from the road (sand which used to go directly into a river). Because it was quickly filling up, the forebay was drastically expanded and deepened to a depth even greater than the garden itself. This forebay was planted with quick sprouting annual rye to stop the immediate erosion of the dirt road. Some of the drainage from the road was also cut off by creating water bars to shunt water off into the woods in small sections. This seemed to effectively address the problem and the raingarden plus these other features now provide a good benefit to the river, with the expectation that there will need to be an annual cleanout of the large sediment forebay.

The second largest raingarden, located in the center of a paved (but beat up) cul-de-sac, kept having plants run over by delivery trucks cutting the corner too close. Markers were added to draw attention to the boundaries of the garden. The third largest garden did not fill up with water at first during even the most intense thunderstorm, so the employee-owner diverted more runoff into it as he felt it was more satisfying to maximize the volume of treated stormwater and it was obvious that his garden could handle more flow. Some employees reported they enjoyed seeing their gardens filling up and rapidly infiltrating because you could clearly see

the environmental benefit. Most of the smaller raingardens rarely showed ponded water, with essentially no water ever leaving by surface runoff. This suggests that most people would never know these were raingardens at all unless they drain a large enough area to pond during large storms. The general consensus was that this might be due to the heavy compost component and its absorptive capacity as it seemed to extend the engineered capacity of the units.

Weeding was something that all gardeners in the group had anticipated, but the non-gardener employees were surprised to realize that weed seeds could blow in and sprout and that there would be some initial weeding required. Some needed training in how to weed after a rain to make the pulling easier, and to pull them when they're small. On average, people found that weeding monthly during the first growing season was all that was needed because of the mulch layer. As the desirable plants fill in, weeding is likely to be reduced to once or twice per year. No fertilizers of any kind were added to any of the gardens, but one of the experienced gardeners did sprinkle her plants with low nutrient seaweed fertilizer, which seemed to boost their blooms and performance.

One of the most surprising results of this effort was that some of the engineers who had never been exposed to gardening began to discuss native plants and various species in a familiar way, with pictures frequently shared nearly as proudly as new baby photos. We were all amused that the scientists laid out their plants rather randomly with a 'natural look', while the engineers measured the spacing between each plant and had perfect symmetry in the layout. One employee who had been about to sell her house in part due to drainage issues, is now considering staying because she loves her raingarden so much and because it has resolved some of the drainage issues she previously experienced. During the summer, she was quoted as saying on several occasions "I hope it rains this weekend so I can see how my raingarden is performing." Overall, the project has been a great experience and the LID Working Group looks forward to publishing additional results and making adjustments as needed.

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About Eileen Pannetier

Eileen Pannetier is President of [Comprehensive Environmental Inc.](#), a civil and environmental engineering firm with offices in Massachusetts, Rhode Island and New Hampshire. She has a Masters Degree in biology and over 20 years of experience in environmental consulting.

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