

Features Available Online

Burnsville Rainwater Gardens



A Burnsville home before and after construction of a rainwater garden that filters large quantities of stormwater.

Although stormwater runoff carries more than 85 percent of pollutants to Minnesota's lakes and rivers, the increasing volume of that runoff from impervious surfaces is just as big a problem. Parking lots, roads, and drainage pipes send stormwater directly into lakes and rivers; the amount and force of that runoff result in flooding and shoreline erosion, including the destruction of plants. In addition, the stormwater carries harmful substances to lakes and rivers: sediment, which reduces water clarity, and phosphorus from fertilizers, oil and grease and atmospheric deposition, which promote the growth of algae. One increasingly popular way to filter and reduce the volume of stormwater runoff is with rainwater gardens.

By capturing runoff in shallow depressions and letting it to soak into the ground, rainwater gardens not only lowers the peak flow, but increases the base flow of water that reaches lakes and streams, but help recharge stores of groundwater in aquifers. Moreover, they filter out sediment and other pollutants like oil, grease, and heavy metals by catching about the first inch of runoff, which contains the highest concentration of pollutants. Rainwater

gardens transform stormwater from a destructive carrier of pollution into a source of sustenance for plant and wildlife habitats: the plants thrive on nitrogen and phosphorus, while their stems trap sediment. Rainwater gardens are being incorporated into many new and existing areas for their environmental benefits, as well as their natural beauty.

Minneapolis-based Barr Engineering Company began working with the city of Burnsville, Minnesota, in early 2002 to develop a plan for improving the water quality of Crystal Lake by adding rainwater gardens to a 20-year-old neighborhood. To measure the effectiveness of the gardens, two nearly identical neighborhoods were chosen for the project: one to be “retrofitted” with 17 rainwater gardens, and the other, just one street away, to serve as a control site.

Leslie Yetka, a water resources specialist for the city of Burnsville, got the ball rolling by obtaining funds for a stormwater-treatment study — \$30,000 from the city and a \$117,000 grant from the Metropolitan Council, which is a regional planning agency for the seven-county Twin Cities metro area. The challenge she faced was finding an affordable way to significantly reduce runoff from residential areas that already had curbing and conventional storm sewers in place. Leslie explains, “We didn’t have room for traditional treatment approaches such as stormwater ponds, so we needed to focus more on treating the runoff at its source, or basically at each home.” The Dakota County Soil and Water Conservation District provided initial technical expertise in evaluating alternative stormwater-treatment practices at a residential-lot level. Then Leslie hired Barr to help identify which treatment technique, within the scope of the study funds, would result in the greatest reduction of runoff.

After discussing budgets, goals, options, and constraints, they determined that rainwater gardens offered the most promising solution for decreasing the amount of stormwater entering Crystal Lake. Barr would design the rainwater gardens and select appropriate plantings, as well as work with Leslie in educating homeowners and overseeing the construction process.

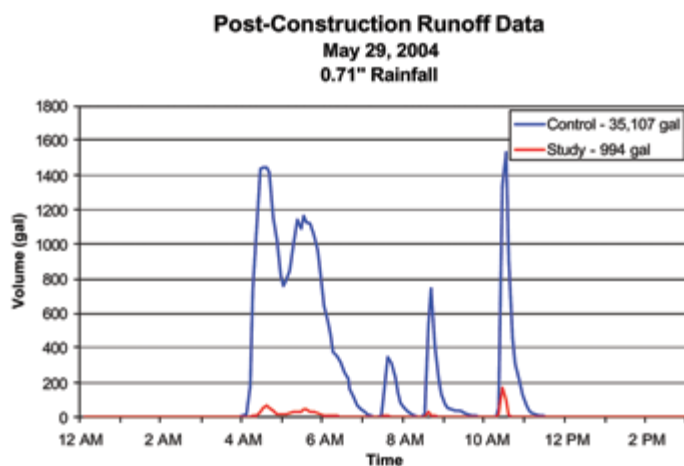
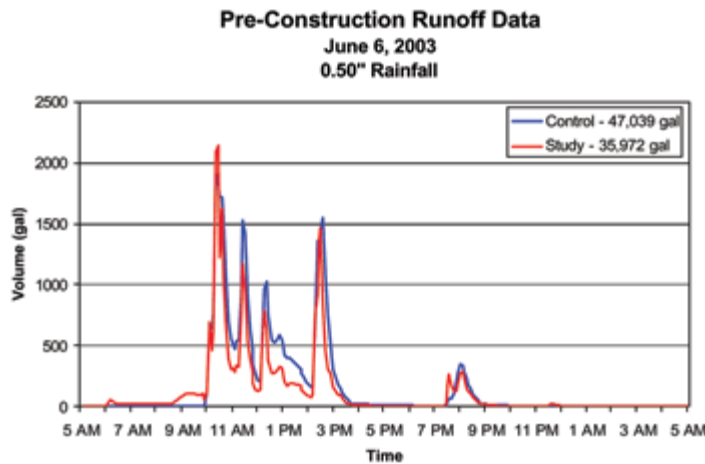


Cuts in the curb allow stormwater to enter the gardens from the street.

At the start of the project, in February 2002, the engineering firm worked simultaneously on two things:

1. With Leslie, talking to residents who lived around Crystal Lake and hosting a series of seminars to explain what was being done to improve water quality in the lake and how rainwater gardens could help
2. Evaluating the suitability of the soil and the existing topography of neighborhoods for their ability to support effective rainwater gardens

That spring, after three potential sites had been identified, Leslie helped to determine which neighborhood would offer the greatest percentage of voluntary participation in the program. On the street chosen to receive the rainwater gardens, an astonishing 85 percent of residents agreed to participate by planting the gardens and performing minor maintenance on them — far exceeding the anticipated 30 percent buy-in. The resulting plan called for 17 gardens at 14 homes; 13 would be in front yards, four in back yards.



Before work on the rainwater gardens could start, two seasons' worth of stormwater data from both the selected neighborhood and the "control" neighborhood needed to be collected. Barr installed gauges to measure how much runoff poured into Crystal Lake from each neighborhood. Later, the same gauges would show how successful the gardens were in reducing the volume of stormwater entering the lake.

The next step, in March 2003, was to design the gardens. Kurt Leuthold, P.E., a Barr civil engineer, performed runoff calculations to determine the amount of stormwater that the neighborhood received annually; designed retaining walls to allow the gardens to exist a foot below street level and to keep their appearance neat; sized the gardens to fit within utility lines and city easements; and specified the removal and addition of soil where necessary to ensure that each garden had adequate drainage to the sand underneath them.



To prevent soil compaction, excavating equipment was kept on the street.

After completion of the engineering work, Fred Rozumalski, a registered landscape architect at Barr, met with homeowners to review drawings, approve garden sizes, and explain the choices residents could make about the type of rainwater garden that would be created in their yard. There were three options: perennial, wildflower, and shrub gardens. Because plants in a wildflower garden tend to spread quickly without regular maintenance — resulting in an unkempt appearance — most residents chose a combination of the less labor-intensive perennial and shrub gardens, whose plants stay put and help sustain a groomed-looking rainwater garden. One back yard does feature a wildflower garden, which Fred describes as a “little patch of prairie,” suited to its out-of-the-way location.

While Fred met with individual homeowners to show them pictures of suitable plants and draw up plans with customized planting maps, the construction work—excavating and grading—was sent out for bid. Most of the large companies invited to bid submitted very high cost estimates, due in part to the fact that the job was small but tricky because the gardens were located on streetside easements inside grids of water, sewer, power, telephone, and cable TV lines. The best prices came from small companies; the city awarded the work to Mike Tix of Mike’s Lawn and Landscape, based in Hastings, Minnesota, whose staff completed the work with enthusiasm and meticulousness for less than the budget ceiling of \$50,000.

In September, it was time to plant the flowers and shrubs. Fred, Kurt, and Leslie, along with a few other engineering staff members, showed up in the neighborhood on a Saturday morning and helped homeowners complete the planting by noon. The residents had planned a potluck lunch and spent the rest of the afternoon eating, talking, and strolling up and down the street, admiring each other’s gardens. It was the commitment and dedication of these

homeowners, says Fred, that made the Burnsville rainwater garden project “probably the most fun and rewarding project I’ve worked on in my eight years at Barr.”

The results of the project are rewarding, too. Once cuts were made in the curb to allow stormwater to enter the gardens from the street, the amount of runoff entering Crystal Lake from the neighborhood dropped drastically. Compared to its sister street with no gardens, the study street contributes about 90 percent less stormwater to the lake. The decrease in runoff volume means that less phosphorus and sediment are entering the lake, too, which helps preserve water clarity and fish populations; it also minimizes the sudden rise in water level that usually follows a storm and contributes to shoreline erosion. Although runoff data are still being analyzed, Leslie says the results far exceed her expectations. Her goals are to use this project to demonstrate the success of rainwater gardens and to begin incorporating the study’s findings into other existing and new neighborhoods in Burnsville.



The gardens were designed to be neat and colorful so that homeowners would enjoy and be motivated to care for them.

The project is unique in Minnesota — and perhaps the country — because it involved fitting gardens into a neighborhood that already had a traditional curb-and-gutter design. Curb cuts at each garden capture road runoff, which is the most significant source of stormwater from a neighborhood. Also, these gardens are believed to be some of the first designed for attractiveness, high performance, and ease of maintenance in a residential setting.

Because it was a pioneering project, both the city and Barr learned a few lessons that will help future projects go more smoothly. For instance, they probably won’t waste time soliciting bids from large construction firms, and they’ll likely incorporate eight-inch stone “drop waterfalls” to help slow the

speed at which runoff enters the gardens (a feature that was added to the Burnsville gardens toward the end of the project).



Soil quality was improved with compost and carefully graded.

Leslie is often asked how the city obtained such a high level of participation for the study. She says one of the keys was having both an engineer to design the gardens and a landscape architect who met with individual homeowners and worked closely with them to come up with planting designs that fit not only their properties, but also their levels of commitment for long-term maintenance. “As soon as most of the homeowners met Fred,” says Leslie, “and found out they essentially had a landscape architect at their disposal, they were like kids in a candy store!”

She also credits personal service and attention to detail for the high participation rate. “What the homeowners really cared most about was having a beautifully designed garden to enhance their property, so aesthetics were primary to them,” she says. “Runoff treatment was secondary, for the most part. Also, we spent a lot of time meeting with the homeowners trying to educate them about runoff and water quality and why this study was important.”

According to Fred, a frequent reason that rainwater gardens don’t succeed with homeowners is that, if not thoughtfully planned, the gardens can look weedy and uncontrolled. That’s why his designs incorporated clean edges, stone retaining walls, and flowers and shrubs that are colorful, functional, and prone to stay confined to a garden. To best ensure not only the gardens’ visual appeal but their effectiveness at filtering stormwater, Fred and Kurt amended the upper layers of soil with a generous amount of compost, which was needed to both support the selected plantings and provide a high degree of

drainage to the sandy layer of soil underneath.

Another aspect of the project that contributed to technical success was careful site surveying. The neighborhood's topography, landscaping features, and utility lines were all factored into garden design. And the tremendous amount of construction oversight, which Leslie concedes may not be feasible in some cases, allowed the gardens to be constructed exactly as planned. In addition to the necessity for what Kurt calls "precision excavating" within the utility grid in each yard, there was little room for error in elevations, because the gardens wouldn't function as designed if established at too high or too low a ground level. Leslie says a contractor like Mike Tix, who pays close attention to detail, is extremely important, as is having earth grades and soil compaction checked regularly during construction.

Since the project began, the Dakota County Soil and Water Conservation District has conducted home-runoff audits on each lot in the study neighborhood to provide homeowners with information on ways to further reduce runoff from their properties, such as redirecting downspouts, installing rain barrels to capture roof runoff, adding gutters in strategic locations, and aerating the lawn to enhance rainwater infiltration. **L&W**

For more information, contact Barr Engineering Company, 4700 W. 77th St., Suite 200, Minneapolis, MN 55435, (952)832-2600 or (800)632-BARR or Fax (952)832-2601.

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