Garrett Hill Coalition WREN project journal

Managing Stormwater in our Back Yards – Rain Garden Workshop, Clem Macrone Park, Radnor Township, October 27, 2012

Grant award

In June 2012, the Garrett Hill Coalition (GHC) was awarded a $4,100 grant by the Water Resources Education Network, a project of the League of Women Voters of Pennsylvania Citizen Education Fund for its project titled: "Managing Stormwater in Our Back Yards: Valley Run, Radnor Township."

The funding supports two educational workshops and demonstration projects for residents of Radnor and Lower Merion Townships. The programs will illustrate ways to reduce polluted stormwater runoff and remedy flooding problems using landscaping amenities like rain gardens and rain barrels.

Project plans include constructing a demonstration rain garden in Clem Macrone Park in fall 2012. A rain barrel demonstration and distribution project is planned for spring 2013.

Project Partners

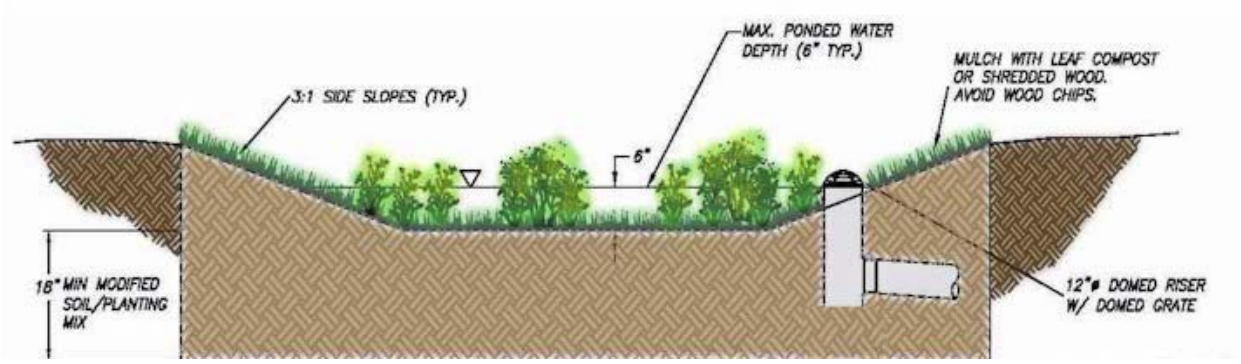
The project partners include Radnor Township; Garrett Hill Community Enhancement Trust; Memorial Library of Radnor Township; Villanova Urban Stormwater Partnership; Delaware Riverkeeper Network; Aqua Pennsylvania; Chanticleer, A Pleasure Garden; and Bryn Mawr Boy Scout Troop #19. Each has made a substantial contribution to the development of the project.

Percolation and soil testing

With the help of Radnor Township's Public Works staff, a location at the west end of the parking lot at Macrone Park was selected to construct the rain garden, an area that receives the water that drains from the parking lot's impervious surface. The site gives the opportunity to build a rain garden that will slow and filter the water that drains from the parking lot before it flows into Valley Run and the Darby Creek watershed.

Soil testing – The soil of the chosen site, however, was compacted and made up of clay silt soil with a relatively low proportion of sand and loam. To determine the drainage of the site, we submitted a sample of the soil to Penn State University's Agricultural Analytic Services Lab for a particle size analysis. This test shows percentages of sand, silt and clay, which infers infiltration ability of the garden subsoil. It helps to determine the ease of infiltration that a soil provides and the capacity of the garden. Our test showed a relatively high level of clay and silt and a low level of sand, making it a challenging mix for rain garden construction. The soil conditions and siting of the garden made its design more challenging.

Infiltration Testing – We performed a simple infiltration test that confirmed that the soil in the rain garden location drained poorly. [It is necessary to call the PA1call (811) to confirm that there are no utilities underground before you dig.] Infiltration testing can be carried out in several ways. The PA Department of Environmental Protection provides a good introduction to methods of testing.



Rain Garden Size - Determining the size of the garden depends upon the infiltration capacity of the soil and the square footage of the area to be drained. Because of the poor drainage and large area of the parking lot, we needed to maximize the capacity the rain garden to manage the volume of storm runoff. In consultation with John Nystedt of the Delaware Riverkeeper Network and Rob Traver of Villanova University, Urban Stormwater Partners, we determined that we needed to enlarge the garden from 120 square feet to 240, to excavate a deep rain garden, five feet in depth, and remove the clay soil, replacing it with a pre-mixed sandy soil that would allow easy infiltration of stormwater. In addition, the design involved laying perforated drainage pipes at the bottom of the rain garden basin and a channel at ground level to handle overflow in case of extreme rain storms. Suddenly our small project again increased in scope and complexity. The schematic drawing above approximates our garden design. There is a ponding area for surface water storage to a depth of approximately 8 inches; then there is 18" of sandy quick-draining planting soil mix. The next 18" below is a retention basin, including roughly 8" of sand and underdrain piping.

We planned to build the rain garden on October 27, 2012, when the Boy Scout Troup 19 would complete both the construction and planting of the garden. Earlier in the week, the Radnor Township Public Works department went to work, preparing the site. They removed three ragged spruce trees and excavated the large garden trench, approximately 20 x 12 x 4 feet. Finally, they broke up the soil surface at the bottom of the trench. A roll of perforated pipe was brought in, encased in a porous fabric sleeve to prevent silt from building up inside the pipe and blocking drainage. Deliveries of sand, river rock, and mulch arrived in advance of the work day as well.

Garden construction

The Macrone rain garden design aimed to create a 'bioretention basin' that could hold water for up to 2-3 days before it is completely infiltrated into the ground below. To accomplish this, we installed the roll of perforated pipe at the bottom of the 5 foot deep trench to form an underdrain. The underdrain pipe outflow was positioned about 18 inches above the bottom of the trench, enabling a retention basin of the same depth.

Under the direction of Delaware Riverkeeper Network's John Nystedt, the garden construction began at around 9 am, on Saturday, October 27. Sixteen scouts, three troop leaders, five project partners joined in the day's work. The scouts' first chore was to position perforated drainage pipe and smooth a layer of sand over it. Once the pipe was in place, the drainage channel formed into the side of the garden trench, allowing overflow to drain out of the garden at 18" above the bottom of the trench. At ground level, we formed a shallow fabric-lined gully as a ground surface overflow. Once we arranged the pipe and spread the sand, the garden trench was ready to receive the garden soil.

We had developed a schematic plan for the garden and calculated the volume of soil to purchase at around 30 cubic yards. The dump truck made three trips, delivering 35 yards in the end. John Nystedt kept the scout team busy distributing the soil and sculpting the final garden shape. They formed a berm at the rear of the garden to form a holding pond at the surface, and formed the swale or gully for overflow during extreme rain events. Outside of the garden trench, they formed additional shallow channels to direct the flow of stormwater to the garden. They lined these with river rock to help protect the swales.

Once the garden was shaped, the scouts and helpers planted the larger shrubs. They then spread three inches of mulch over the garden surface. They anchored a layer of jute fabric over the mulch with stakes and planted the smaller garden plants through the fabric. The mulch and jute fabric help to stabilize the soil and garden structure until the plantings become established. The plants selected for the garden include Pennsylvania native shrubs, grasses and flowering perennials known to be somewhat shade and salt tolerant. These include sweetbay magnolia, winterberry, spicebush, pepperbush, blue flag iris, cinnamon fern, and white turtlehead. In 2013, we will plant additional plants that become available in the spring.

Work on the garden site ended around 3 pm, when scouts departed and team leaders completed the final clean-up.

Rainy day

The WREN grant project partners and workers installed the rain garden, knowing that hurricane Sandy was headed our way the next day. We discussed the merits of finishing the installation and planting the plants versus waiting for better weather. The decision was made to complete the installation, putting confidence in the garden design. The rains of Sandy fell and the garden filled with water. The garden is not designed to manage the flow of the prolonged extreme rain accumulation of a hurricane. The Macrone Park rain garden managed the excess stormwater from Sandy, however, without damage to its structure or plants. At the peak of the storm, excess water flowed over the garden overflow swale as well as out of the underdrain outflow pipe. The flow did not erode the garden surface or form or disturb the garden plants. When the precipitation slowed, the garden drained again within several hours.

In our region of Pennsylvania, 90% of rainfall events are less than 1.25 inches, with approximately 42 total inches of rain per year. The Macrone Park rain garden captures, slows, and cleans the run-off from the parking lot for rainfalls that are 1 inch or less. These one-inch rainfalls represent the “first flush” of run-off that carries the majority of the pollutants into the rain garden for cleaning. Excess rain water flows through the garden and out the underdrain exit or over the overflow swale. Most rainwater flowing from the parking lot will pass through the rain garden.

When finished, the GHC WREN project will provide signs identifying the structural features and plants of the Macrone Park rain garden and an explanation of how the rain garden works within the Darby Creek watershed.

Finally, we will note that the Macrone rain garden has a larger and more complex design than is needed for most home installations. Most rain gardens have more favorable soil and infiltration characteristics and collect stormwater from a smaller roof and/or paved area. A typical rain garden can be small simple shallow depression with water tolerant native plants.

Project Information

The Garrett Hill Coalition is working with project partners Radnor Township; Garrett Hill Community Enhancement Trust; Memorial Library of Radnor Township; Villanova Urban Stormwater Partnership; Delaware Riverkeeper Network; Aqua Pennsylvania; Chanticleer, A Pleasure Garden; and Bryn Mawr Boy Scout Troop #19.

The project has been made possible through a Community Watershed Education Grant awarded by the Water Resource Education Network (WREN), a project of the PA League of Women Voters Citizen Education Fund.

Grant funding is through the Pennsylvania Department of Environmental Protection's Nonpoint Source Management Program and Section 319 of the federal Clean Water Act, administered by the Environmental Protection Agency.