Burnsville Stormwater Retrofit

Burnsville, Minnesota (2004)

Background:

In an ongoing effort to protect Crystal Lake from excess phosphorus and large volumes of stormwater runoff from surrounding hard surfaces, the Metropolitan Council, along with the City of Burnsville, Minnesota and the Dakota County Soil and Water Conservation District funded a rainwater garden system to infiltrate street runoff. To better document the effect of rainwater garden implementation, this project involved the completion of a "paired watershed" study, in which two very similar residential areas were monitored —one was the study's control site and the other treatment watershed employed 17 new rainwater gardens within a 25-lot, 5.3-acre neighborhood with traditional curb and gutter (see figure on right). The project, a retrofit of a 1980s neighborhood, involved individual designs for each resident-participant's property and close attention to homeowner education and easy maintenance. The gardens were primarily designed to capture street runoff through the installation of curb cuts at each garden. The depressions feature gradual side slopes, limestone retaining walls, and colorful plantings. They were carefully sized to, at a minimum, accept the first 0.9 inches of rainfall runoff from the impervious surfaces in the subwatershed for each storm event.

Monitoring:

A "paired watershed" study was conducted by using the two similar and adjacent subwatersheds in the Crystal Lake watershed—one served as a study control and the other was the site of the 17 rainwater gardens. Stormwater runoff was monitored both prior to and after installation of the gardens. A linear regression and analysis of variance was conducted on the paired data from the calibration period to evaluate the significance of the relationship. At the end of the treatment period the significance of the effect of the rainwater gardens was determined by completing an analysis of variance on the treatment regression equation and comparing the difference between the slopes, and confidence levels of the calibration and treatment regressions.

Conclusions:

The paired watershed study determined, with greater than 95 percent confidence, that the rainwater gardens designed to capture 0.9 inches of rainfall reduced all runoff volumes by approximately 90 percent. On average less than 0.01 inches of runoff was detected for each storm event in the treatment area (with over 75% of the storms resulting in no runoff at all) versus 0.12 inches in the control area. No storm exceeded 1.5 inches.

This project, however, confirms that existing residential neighborhoods with sandy soils, gradual slopes and 15-foot rights-of-way (from the back of curb) can be successfully retrofitted with rainwater gardens and provide very high levels of runoff reduction and stormwater quality improvement. In addition, more than 80 percent of the homeowners with installed rainwater gardens participated in maintaining their area. This indicates that rainwater garden BMPs can be viewed as an amenity to property owners.

It also needs to be pointed out that this site did not meet the conditions required by the draft aspirational goal.