Rain Garden

Linglestown Middle School, Lower Paxton Township, Dauphin County, Pennsylvania

Excavation of the bioretention cell, early Spring 2006

In forested watersheds, most rainfall or snowmelt sinks into the ground and travels slowly through the subsurface to receiving streams. This tends to minimize flood peaks and preserve stable, healthy streams. In contrast to this, urbanized basins are characterized by the rapid movement of storm runoff from impervious surfaces such as streets, parking lots, and rooftops into gutters and pipes designed to quickly convey this storm runoff to streams. As in so many other urban basins around the country, this rapid runoff is perhaps the single most significant impact to Paxton Creek watershed streams. Not only does this lead to local flooding, but channels are eroded by the extra quantity and duration of flow. At the same time, water quality is degraded by pollutants such as metals, petroleum products, nutrients, and fine sediment washed off of impervious urban surfaces.

Detention basins have been used for years to reduce the high peak flows in streams resulting from storm runoff. While these facilities may succeed to some degree in alleviating flooding, they often fail to prevent prolonged stream flow at still high and erosive levels (which promotes stream channel degradation) and they commonly do not provide much in the way of a water quality benefit.

Rain gardens represent a more recent stormwater management practice designed to both enhance water quality and reduce the quantity of storm runoff discharged to receiving streams. These facilities (which are also called bioretention areas) are just one of a whole suite of integrated management practices which fall under the general heading of Low Impact Development (LID). As an overall stormwater management strategy, LID emphasizes source area controls which are intended to mimic as much as possible the dominant hydrologic processes in fully forested drainage basins, namely infiltration and discharge to streams via the groundwater pathway.

In 2005, the Paxton Creek Watershed and Education Association (PCWEA) received a grant from the National Fish and Wildlife Foundation to install several demonstration LID retrofit projects within the Paxton Creek basin. (A "retrofit" is a management practice installed after an area has been developed.) One of the selected sites was the Linglestown Middle School, where PCWEA partnered with the Central Dauphin School District to install a rain garden in Paxton Creek's headwaters. The rain garden was installed in 2006.

The completed facility after installation of the mulch cover but before planting

Rain gardens can have many different designs, but the basic idea is that any amount of rainfall that is allowed to soak back into the ground instead of rapidly running off the surface is a good thing. Not only does a certain amount of this water evaporate from soil and plant surfaces, but an additional amount of water is taken up by plant roots and transpired back to the atmosphere. Any remainder proceeds slowly to the stream as groundwater. Bottom line: Water routed through a rain garden or other LID facility does not add to storm flow in streams. Moreover, the filtering that occurs within the rain garden's buried "bioretention cell" – and within the soil generally – acts to remove many of the pollutants contained in urban runoff before these can reach the stream.

As depressional (rather than the usual mounded) landscaped features, rain gardens can be tailored to almost any site situation. Native vegetation is generally favored for planting in bioretention areas because of the support these plants provide to the urban ecosystem (such as food for birds, butterflies, etc.) and because native plants tend to require little maintenance once they have become established.

The Linglestown Middle School rain garden was installed within a gently sloping, grass-covered area at the edge of an asphalt parking and play area. The closed depression into which water flowing off the asphalt drains was created by building up a low berm on the downslope side of the landscaped area. The base of the berm was formed from a portion of the material excavated from the adjoining bioretention cell, with a deep layer of topsoil placed on top of this to encourage healthy plant growth.

The ten-foot wide bioretention cell was created by excavating to a depth of two feet (see the first photograph on the opposite page) and then backfilling this with a mixture of previously excavated material (75%) and yard waste compost (25%). No excavated material was removed from the site. Finally, the entire surface (berm and bed) was covered with a three-inch layer of shredded bark mulch.

Newly planted rain garden; note wooden baffles.
Additional plants were added in the Fall of 2006

As in any LID retrofit project, the design of this rain garden was required to adapt to the unique features of the site. For example, because the site not only slopes away from the parking area but towards the pine tree (see photographs), wooden baffles were installed across the depressed area to detain and pond storm runoff along the cell's 75-foot length. Many rain garden designs also suggest the installation of a gravel filter strip between the edge of the impervious surface and the bioretention cell. This did not seem like a wise alternative at a middle school, so the strip between the parking and play area and the bioretention cell was re-seeded to lawn afer project construction.

Herbs

Boneset	Purple Coneflower
Spotted Joe Pye	Brown-eyed Susan
Showy Coneflower	Blazing Star
False Aster	Swamp Milkweed

Shrubs

Gray Dogwood	Bottlebrush
Serviceberry	Steeplebush
American Elderberry	Ninebark
Winterberry Holly	Red-osier Dogwood

Trees

Eastern Redbud	Red Buckeye

Most planting was performed by community volunteers in the Spring of 2006, with additional herbaceous plantings installed in the Fall. Along with plant materials purchased with grant funds, The Alliance for the Chesapeake Bay donated additional plants used at this site. The native plants used in the garden (see the box above) were selected mainly for their attractiveness (showy flowers or colorful leaves and stems) and wildlife food value. Plants adapted to moister conditions were installed within the constructed depression, with upland (drier-adapted) species planted on the downslope berm.

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