Low-impact development (LID) is a design approach to manage stormwater runoff as part of green infrastructure. LID emphasizes conservation and use of on-site natural features to protect water quality. This approach implements engineered small-scale controls to maintain the pre-development flow characteristics of the watersheds through infiltrating, filtering, storing, evaporating, and detaining runoff close to its source. Green infrastructure investments are one approach that often yields multiple benefits and builds city resilience.

Typical practices and controls Planners select structural LID practices for an individual site in consideration of the site's land use, hydrology, soil type, climate, and rainfall patterns. There are many variations on these LID practices, and some practices may not be suitable for a given site. Many are practical for site renovation projects, as well as for new construction. Frequently used LID practices include:

- [Bioretention] or [Rain Gardens]
- [Rain Barrels]
- [Green Roofs]
- [Permeable Paving]
- Grassed swales, also known as [bioswales]

Examples of LID projects in Shelby County

- [Rehabilitation of Detention Basin at Holmes Road and Riverdale Road]
- [Rain Gardens at Peggy Edmiston Administration Building]
- [Shelby Farms Trails Gateway Improvements]

Bioretention is the process in which contaminants and sedimentation are removed from stormwater runoff. Runoff passes first over or through a sand bed, which slows the runoff's velocity, distributes it evenly along the length of the ponding area, which consists of a surface organic layer and/or groundcover and the underlying planting soil. The ponding area is graded, its center depressed. Water is ponded to a depth and gradually infiltrates the bioretention area or is evapotranspired. The bioretention area is graded to divert excess runoff away from itself. Stored water in the bioretention area planting soil exfiltrates over a period of days into the underlying soils.

Rain Garden is a designed depression storage or a planted hole that allows rainwater runoff from impervious urban areas, like roofs, driveways, walkways, parking lots, and compacted lawn areas, the opportunity to be absorbed. The primary purpose of a rain garden is to improve water quality in nearby bodies of water and to ensure that rainwater becomes available for plants as groundwater rather than being sent through stormwater drains straight out to our rivers or lakes. In fact, it can actually reduce rain runoff by allowing stormwater to soak into the ground (as opposed to flowing into storm drains and surface waters which causes erosion, water pollution, flooding, and diminished groundwater) and cut down on the amount of pollution reaching creeks and streams by up to 30%.

Rain Barrel is a water tank used to collect and store rain water runoff, typically from rooftops via pipes. Rain Barrels are installed to make use of rain water for later use, reduce use of public water for economic or environmental reasons, and aid self-sufficiency. Stored water may be used for watering gardens, agriculture, flushing toilets, in washing machines, washing cars, and also for drinking, especially when other water supplies are unavailable, expensive, or of poor quality, and when adequate care is taken that the water is not contaminated and is adequately filtered.

A **green roof** is a roof of a building that is partially or completely covered with vegetation and a growing medium, planted over a waterproofing membrane. Green roofs serve several purposes for a building, such as absorbing rainwater, providing insulation, creating a habitat for wildlife, increasing benevolence and decreasing stress of the people around the roof by providing a more aesthetically pleasing landscape, and helping to lower urban air temperatures and mitigate the heat island effect. Green roofs effectively utilize the natural functions of plants to filter water and treat air in urban and suburban landscapes.

Permeable paving is a method of paving vehicle and pedestrian pathways that allows for infiltration of fluids. In addition to reducing surface runoff, permeable paving can trap suspended solids therefore filtering pollutants from stormwater. Examples include roads, paths, and parking lots that are subject to light vehicular traffic, such as cycle-paths, service or emergency access lanes, road and airport shoulders, and residential sidewalks and driveways.

Bioswales are landscape elements designed to concentrate or remove debris and pollution from of surface runoff water. They consist of a swaled drainage course with gently sloped sides (less than 6%) and filled with vegetation, compost and/or riprap. The water's flow path, along with the wide and shallow ditch, is designed to maximize the time water spends in the swale, which aids the collection and removal of pollutants, silt and debris. Bioswales are also beneficial in groundwater recharge and are effective stormwater mitigation tools.

Rehabilitation of Detention Basin at Holmes Road and Riverdale Road

The Shelby County Storm Water Management Program has completed work transforming a 7.43 acre, unmaintained detention facility into an attractive wetland demonstration site. The property, located near the intersection of Holmes and Riverdale Roads in southeast Shelby County, carries run-off from a 408 acre watershed, including a portion of Mississippi, and eventually drains into Nonconnah Creek. The site was designed in 2001 to provide storage of increased storm water runoff resulting from years of development adding impervious surfaces, such as, roof tops, driveways, and parking lots.

The original site had numerous challenges. A state-protected “blue-line” stream runs through the middle of the detention area, limiting access and prohibiting disturbance of it by construction operations. This also means that the basin would receive highly variable flows with high velocities which scour the banks and transport large amounts of debris. After a series of intense storms in 2001, the basin’s levee was breached and had to be reconstructed. Routine debris removal operations, involving a track-hoe and dump trucks, could not keep up with industrious beavers who would routinely turn the normally dry pond into a lake, greatly reducing its capacity to store excess stormwater. Access to the site was provided from Old Germantown Road, which runs along the east side of the property. This road has little traffic and large estate-sized lots with mature trees. These factors provided cover for illegal dumping of mattresses, tires and plastic garbage bags into the basin.

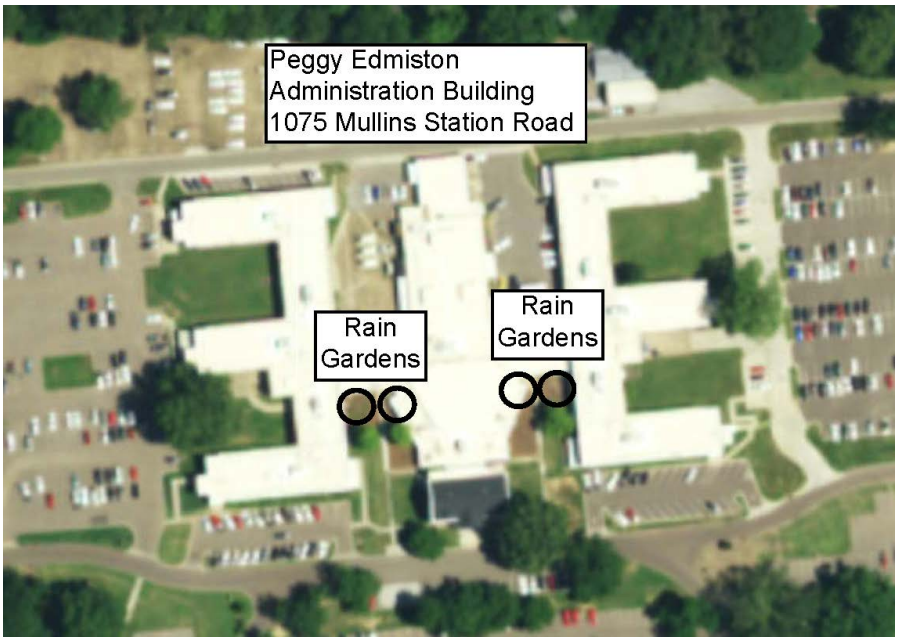
BEFORE
The site shown in December 2001 after the levee failed and water drained downstream

BEFORE
The site shown in June 2006 holding water after beavers blocked the outlet pipes

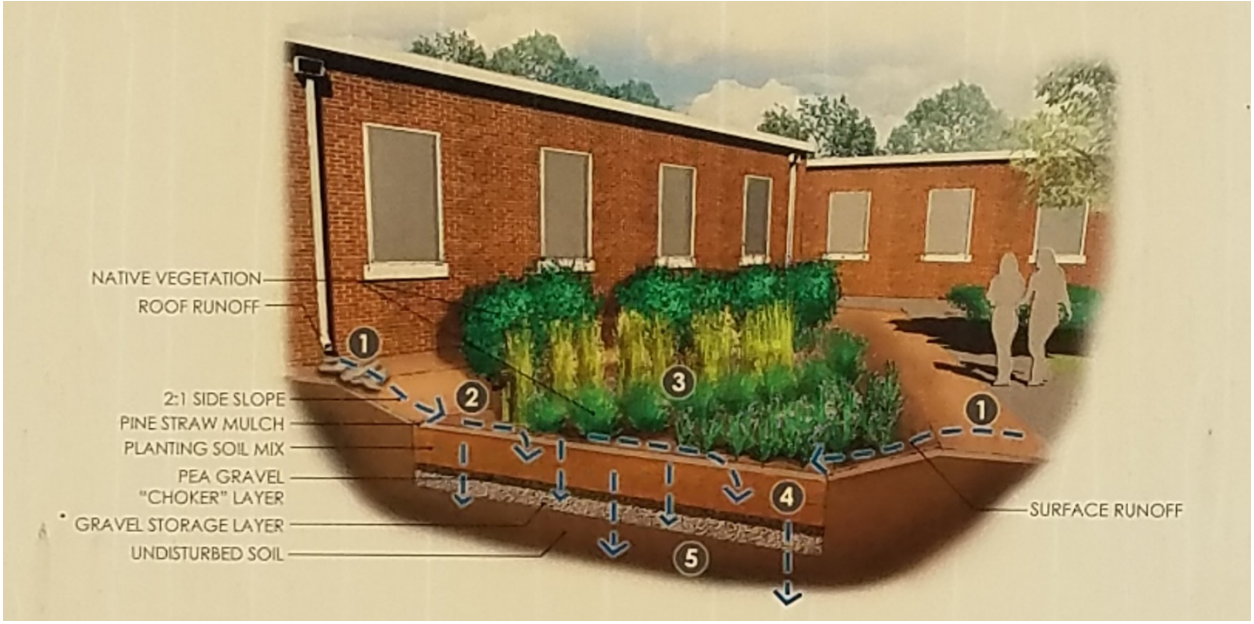
This project transformed the unsightly marshy-bottomed site into an ecosystem that hosts various year-round blooming flowers and plants. Birds and dragonflies have been encouraged to make the wetland home, keeping the mosquito population in check. On a good day, the visitors may see a blue heron from the boardwalk and observation area overlooking the site. Besides flood control, lower maintenance cost and environmental benefits, the saturated conditions and vegetation will recharge groundwater and purify the water of excess nutrients and chemicals.

The project includes a new access route to armored outlet pipes, which strengthen the levee, and decreases the amount of sediment entering the water. This new access point is gated and located off the much more highly travelled Riverdale side. The old access point, off Old Germantown Road, is now landscaped with trees to discourage access to the water's edge. A specifically selected mixture of wetland plants and water-tolerate grasses and flowers were used to provide a native, low maintenance environment. The boardwalk overlook includes an educational plaque to help people understand what the wetland is and how it works. This is the first of many sustainable "Green" development retrofits planned for Shelby County.

Rain Gardens at Peggy Edmiston Administration Building



Through a Tennessee Stormwater Association grant, Shelby County has constructed four (4) rain gardens at the Peggy Edmiston Administration building. These small planted landscape depressions mimic the natural hydrology that existed before the construction of man-made features. These rain gardens are designed to capture stormwater runoff from the 2-year storm event and allow it to infiltrate into the subsoil and transpire into the atmosphere through the native plant foliage. They improve water quality and increase curb appeal.



Shelby Farms Trails Gateway Improvements

This project converted two areas used as borrow pits and sediment control during the construction of the trails into a functional bioretention area. Improvements to the area included the addition of an overlook platform, water's edge access to the wetlands, and new bio-retention ponds that will attract wildlife while preventing pollution from draining into the Wolf River. The Trails Gateway, located on the east side of Shelby Farms Park near Germantown Parkway, is the trail head and marks the start of over 30 miles of pedestrian, bicycle and equestrian trails.

Shelby County Government in partnership with the *Shelby Farms Park Conservancy* and the *Wolf River Conservancy* completed construction work to grade the area and create two wetland ponds, install a rock outfall structure, and add plantings. Other features of this new location are a sidewalk designed to connect the bus loading/unloading zone and handicap ramps to the trail, a scenic overlook platform providing a location to observe the area's wildlife and aquatic insects, an educational sign describing the benefits of bioretention ponds, and a water's edge access point allowing school groups to gather insect and larvae samples.

This project site also serves as a pollution control measure because it is the last developed area that stormwater travels over before entering a tributary of the Wolf River. The site improvements are designed to capture and filter a large portion of the area's stormwater drainage, which includes contaminants from the parking lot, road, and farm land, and prevent them from being released into the river. The wetland ponds are expected to attract a diverse array of wildlife and aquatic insects. The trailhead area will offer schoolchildren and adults new educational opportunities to increase their knowledge of the aquatic environment and the need to take better care of it.