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Fall 2011

Use of GIS to Isolate Impact of Existing Transportation Facilities on Urban Watersheds and to Identify Candidate Transportation Facilities for Impervious Cover Reduction

The water resources literature has established the negative impacts transportation facilities (e.g., roadways and parking lots) have on watersheds. Many older neighborhoods and commercial centers built before ordinances limited impervious cover or required mitigation suffer from the consequences of acres of parking lots and wide roadways (e.g., localized or creek flooding, poor water quality, flow extremes and erosion). Cities, such as Austin, Texas, have chosen to manage this issue by pursuing structural stormwater engineering methods, such as construction of large detention ponds, channelization of creeks or upgrading the size of the stormwater pipe system, as retro-fits for these older areas. However, those solutions do not help to restore the waterways to more natural conditions. The impervious cover of the transportation facilities continues to disrupt the hydrological process of infiltration (for groundwater) and to impair water quality.

An alternative approach explored in this project is to identify where roadway and parking facilities can be reduced in size that would offer the same or better improvements to the urban watershed compared with structural stormwater management approaches. The objective of this project is to use GIS to develop a tool that both 1) helps isolate the impacts of transportation facilities on a developed urban watershed, and 2) helps identify the roadways and parking lots that are the best candidates for impervious cover reduction (considering factors such as traffic and watershed impact, parking requirements, etc). The Shoal Creek watershed in Austin, Texas will be used as the test case.

The HEC-GeoHMS and HEC-GeoRAS tools developed by the Hydrological Engineering Center will be explored to determine how they may help to complete this project. The project will require use of DEM, streamflow, traffic/roadway and land use GIS files and aerial photos. In addition, the City of Austin has conducted several studies on the Shoal Creek watershed, and most recently started a stormwater pipe upgrade in two locations within the neighborhood, so information from those studies will be incorporated into this project.