Suitability Analysis for Stormwater BMP's

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Abstract:

Goals of this analysis include siting areas for implementation of various Stormwater Best Management Practices (BMPs) as defined by the Georgia Stormwater Manual. This analysis will focus on: infiltration basins, bioretention, grass channels, pervious concrete, and stormwater wetlands.

Stormwater BMPs

Infiltration Basin

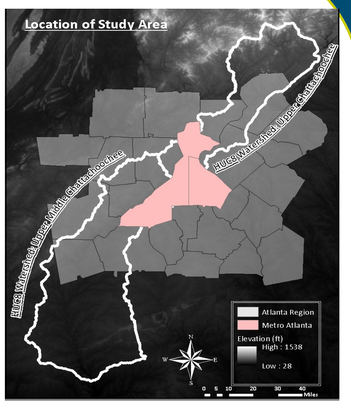
Bioretention

Grass Channel

Pervious Concrete

Stormwater Wetlands

Background:



Water Quality concerns are an important subject where contaminants such as nutrients (nitrogen and phosphorous), heavy metals (copper and lead), and suspended solids runoff into the watershed. Impervious surfaces cause a greater fraction of rainfall to flow overland to rivers and streams rather than infiltrating into soils naturally. As the stormwater flows over parking lots, roadways, and agricultural land, it picks up the aforementioned contaminants transporting them to surface waterways. This project aims to determine threatened areas in two different Chattahoochee watersheds: the Upper Chattahoochee (HUC 03130001) and Upper-Middle Chattahoochee

Methodology:

Data Used:

- Manual Entry of Georgia Adopt-A-Stream Data
- Soil Survey Combination
- DEM & slope calculation
- Park Buffers and Feature to Raster
- HUC watershed and catchment basin delineation
- Impervious Cover
- Land Use recovery based on 2011 data

In model 1, the first process accounts for the quantity of stormwater conveyed; using soil type, slope, and impervious cover in a weighted overlay. The second process accounts for the quality of stormwater discharge.; using conductivity, land use, and park distance in a weighted overlay.

Model 2 then uses the quality and quantity overlays as inputs, and weights them based on how well the BMP addresses the quality or quantity concern. Finally, the highest values are extracted and viewed in the results.

Model 1: Reclassification Values

Table 1

LULC Type	Reclass Value
Water	0
Developed, Open	3
Developed, Low Intensity	5
Developed, Medium Intensity	7
Developed, High Instensity	9
Barren Land	0
Forest	0
Shrub/Herbaceous	0
Hay/Pasture	9
Cultivated Crops	9
Wetlands	0
NoData	NoData

Table 2

Conductance (MΩ)	Reclass Value
0-35	1
35-104	5
104-349	7
349-800	9
NoData	NoData

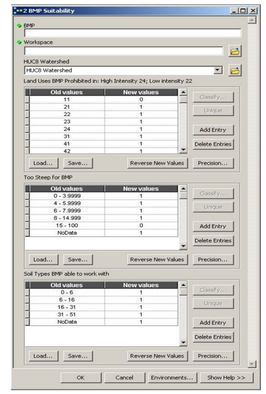
Table 3

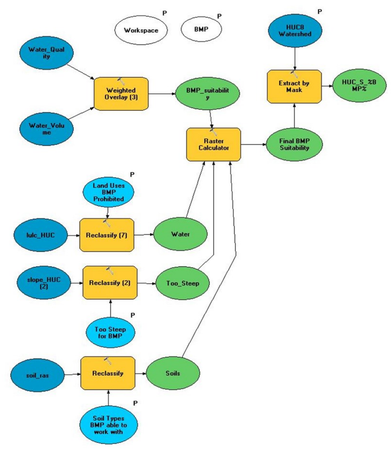
Park Distance (Miles)	Reclass Value
0-0.1	9
0.1-0.25	7
0.25-0.5	5
NoData	1

Table 4

Soil Type	Soil Texture	Infiltration Rate	Reclass
A	Sand, loamy sand, sandy loam	high infiltration rates (>0.3 in/hr)	2
B	Silt loam or loam	Moderate infiltration (0.15-0.30 in/hr)	3
C	Sandy clay loam	Low infiltration rates (0.05-0.15 in/hr)	7
D	Clay loam, silty clay loam, or clay	little to no infiltration (0-0.05 in/hr)	9
B/D	Varies	Type B in drained state, D in undrained state	3
B/C	Varies	Type C in drained state, D in undrained state	5

Model 2: BMP Suitability





Results:

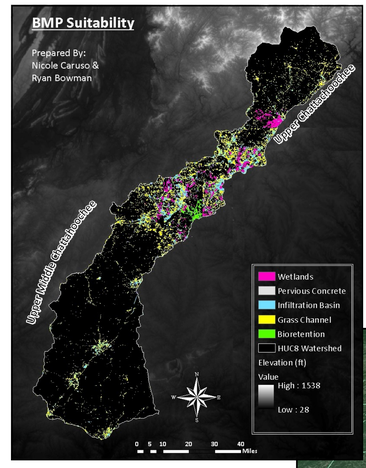
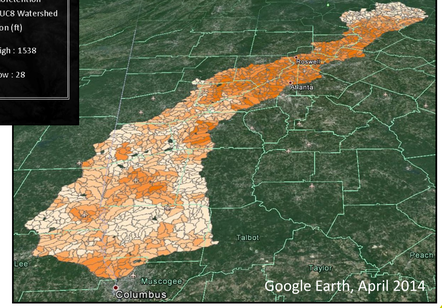


Table 4

BMP Type	Quality vs. Quantity	
	Quality Weight	Quantity Weight
Stormwater Wetlands	70%	30%
Bioretention	60%	40%
Infiltration	50%	50%
Grass Channel	10%	90%
Porous Concrete	30%	70%



Created .kml file for use by developers

Conclusion:

This study identified numerous areas where environmentally preferred Stormwater BMPs can be sited. The results seem reasonable when considering the highest concentration of siting areas are surrounding the metro-Atlanta core; however, greater validation is desired through identifying where BMPs have already been implemented. The models created in this analysis would be useful for future developments in any watershed and could be further enhanced through more accurate and available data.

References:

Georgia Adopt-A-Stream (2013). "Events By Watershed". Accessed [April 15, 2014].

Web Soil Survey. (2012). Gridded Soil Survey Geographic (gSSURGO) by State. http://websoilsurvey.nrcs.usda.gov/. Accessed [April 14, 2014].