

Examples of Landscaping Options that Benefit Stormwater Management

Robert Pitt

Department of Civil and Environmental Engineering
The University of Alabama
Tuscaloosa, AL 35487

Disturbed Urban Soils during Land Development



Soil modifications can result in greatly enhanced infiltration in marginal soils.

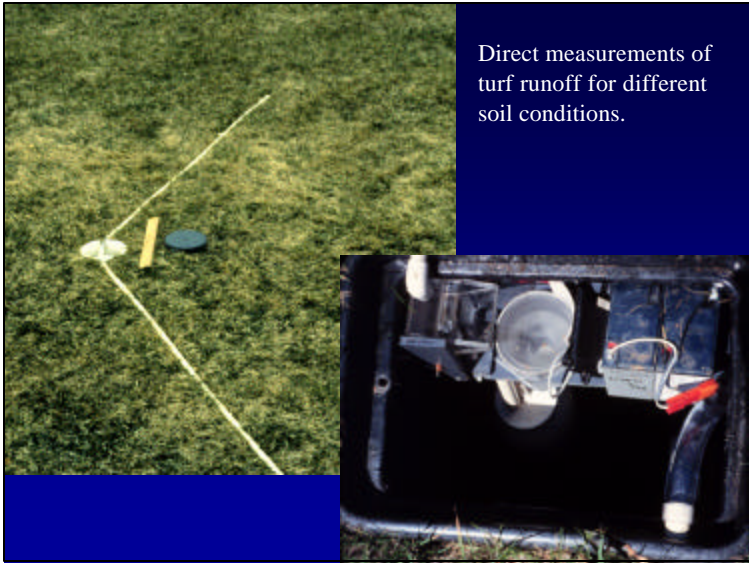


Compaction Measurements



Soil Density Measurements





Direct measurements of turf runoff for different soil conditions.

Infiltration Rates in Disturbed Urban Soils (AL tests)

Sandy Soils

Clayey Soils

Recent research has shown that the infiltration rates of urban soils are strongly influenced by compacted, probably more than by moisture saturation.



Natural forces and management attempts to increase infiltration in compacted soils.



“Green roof” can be used to enhance evapotranspiration losses and delay runoff (Portland, OR)

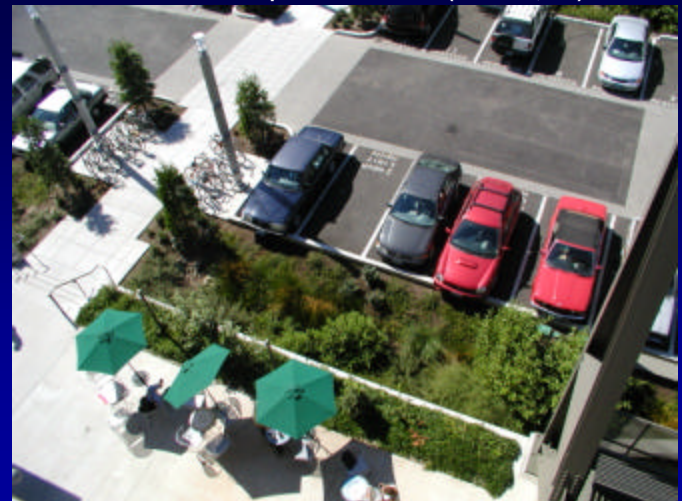
Roof downspout disconnections enhance infiltration of runoff and reduce volume and help recharge groundwater (AL, WI, and Sweden).



Rain Garden Designed for Complete Infiltration of Roof Runoff



Bioretention areas can be located between buildings and parking areas to infiltrate almost all roof and paved area runoff (Portland, OR).





Infiltrative Control Device

Land Use: Commercial

Select Seepage Rate

- Ford - 8 in/hr
- Loamy sand - 25 in/hr
- Sandy loam - 1.0 in/hr
- Loam - 0.5 in/hr
- Sil loam - 0.3 in/hr
- Sandy sil loam - 0.2 in/hr
- Clay loam - 0.1 in/hr
- Silty clay loam - 0.05 in/hr
- Sandy clay - 0.05 in/hr
- Silty clay - 0.04 in/hr
- Clay - 0.02 in/hr
- Rain Bare/Caten - 0.00 in/hr

Use Random Number Generation to Account for Uncertainty in Infiltration Rate

6. Number of Biofilter Control Devices in Source Area or Land Use: 52

Bioblock Number 1

Device Geometry

- 1. Top Area (sf): 320
- 2. Bottom Area (sf): 300
- 3. Depth (ft): 1.00
- 4. Block-filled?
- Fraction of Total Volume as Voids (0 - 1): 1.00

5. Seepage Rate (in/hr): 1.00
Seepage Rate CV: 0.75

Seepage Rate Side: 1.00
Multiplier (0-1) Bottom: 1.00

Select Source Areas from Land Use that Contribute Runoff to Biofilter Control Device(s)

- Rooftop 1
- Rooftop 2
- Rooftop 3
- Rooftop 4
- Rooftop 5
- Paved Parking/Storage 1
- Paved Parking/Storage 2
- Paved Parking/Storage 3
- Depaved P/asp/Storage 1
- Depaved P/asp/Storage 2
- Depaved P/asp/Storage 3
- Depaved P/asp/Storage 4
- Depaved P/asp/Storage 5
- Paved Driveway 1
- Driveway 2
- Driveway 3
- Sidewalk/Walk 1
- Sidewalk/Walk 2
- Large Landscaped Area 1
- Large Landscaped Area 2
- Undeveloped Area
- Small Landscaped Area 1
- Small Landscaped Area 2
- Small Landscaped Area 3
- Other Pavement Area
- Other On-Earth Imp Area
- Other Part-Covered Imp Area

Fraction of Runoff from Selected Source Areas Routed to Land Use Biofilters (0 - 1): 0

Outlet/Discharge Options

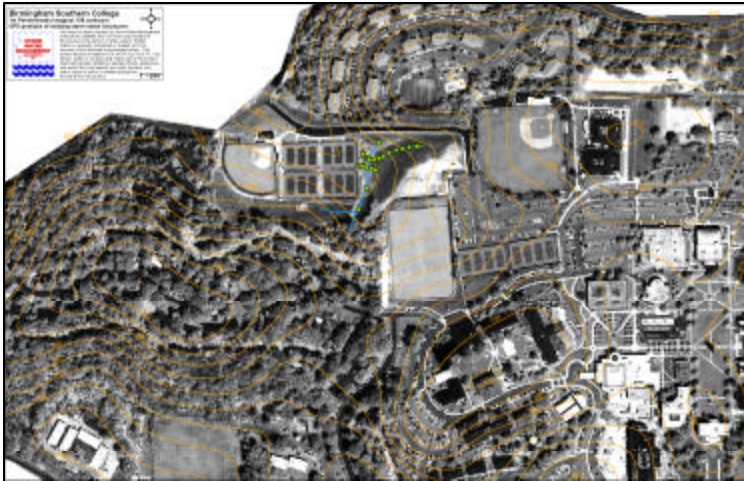
- 1. Slope-Crested Weir
- 2. Broad-Crested Weir
- 3. Vertical Stand Pipe
- 4. Evaporation
- 5. Rain Barrel/Cistern

EDR Existing Outlet

Selected Outlets

- 1 - Vertical Stand Pipe
- 2 - Broad-Crested Weir

Buttons: Delete, Continue, Cancel



Birmingham Southern College Campus (map by Jefferson County Stormwater Management Authority)

Birmingham Southern College Fraternity Row

	Acres	% of Total
Roadways	0.24	6.6%
Parking	0.89	24.5
Walks	0.25	6.9
Roofs	0.58	16.0
Landscaping	1.67	46.0
Total:	3.63	100.0

Supplemental Irrigation

	Inches per month (example)	Average Use for ½ acre (gal/day)
Late Fall and Winter (Nov-March)	1 to 1-1/2	230 - 340
Spring (April-May)	2 to 3	460 - 680
Summer (June- August)	4	910
Fall (Sept-Oct)	2 to 3	460 - 680
Total:	28 (added to 54 inches of rain)	

Capture and Reuse of Roof Runoff for Supplemental Irrigation

Tankage Volume per Building (ft³)	Percentage of Annual Roof Runoff used for Irrigation
1,000	56%
2,000	56
4,000	74
8,000	90
16,000	98

Combinations of Controls to Reduce Runoff Volume

	Total Annual Runoff (ft ³ /year)	Increase Compared to Undeveloped Conditions
Undeveloped	46,000	--
Conventional development	380,000	8.3X
Grass swales and walkway porous pavers	260,000	5.7
Grass swales and walkway porous pavers, plus roof runoff disconnections	170,000	3.7
Grass swales and walkway porous pavers, plus bioretention for roof and parking area runoff	66,000	1.4