Soil and Turf Management for Stormwater 2

MIDS Group, June 15, 2012

Minnesota Pollution Control Agency

p-gen3-14k

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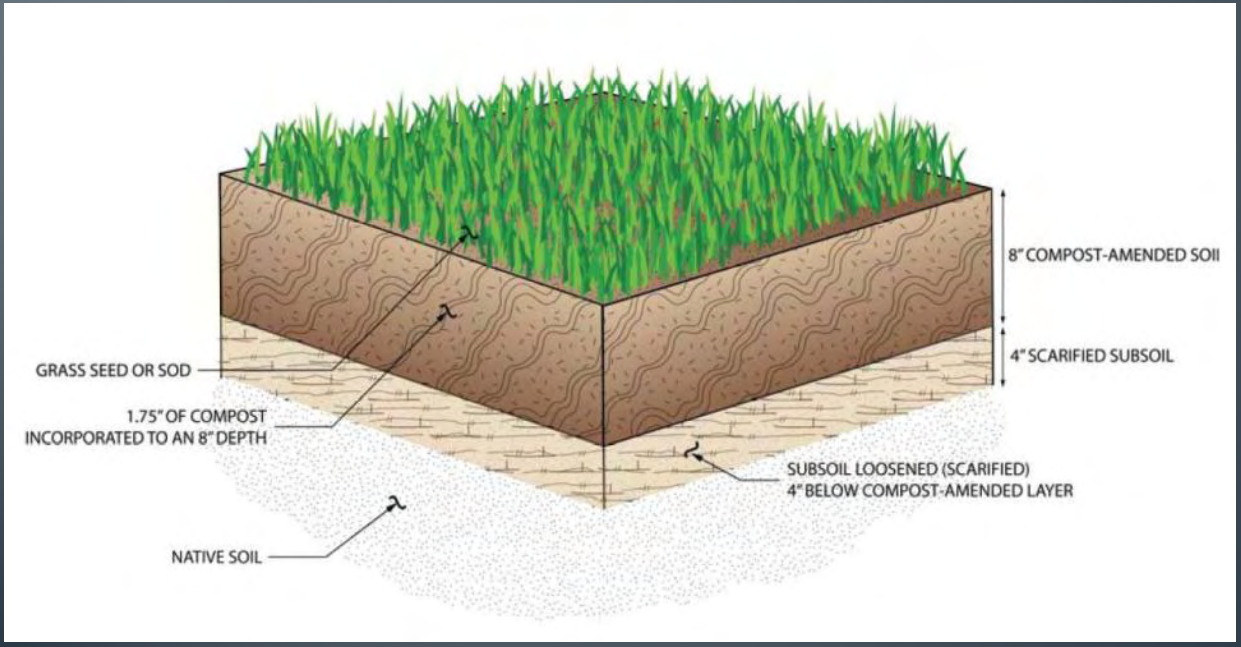
Engineers • Scientists
Business Professionals

Soil and Turf Management as a BMP

- Below ground component – amended soils
- Above ground component – managed turf



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Below Ground:
Reduce Bulk Density By Decompacting Soil

- Decompact subgrade to depth of 12”
- Chisel plow or subsoiler/ripper
- Rototiller or rotovator not acceptable

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Below Ground: Improve Soil

- Achieve 8-inches of soil with an organic content of 5% by weight
  - Amend in place with compost
  - Bring in soil
  - Demonstrate existing soils meet organic content

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Above Ground:
Select Proper Seed Mix for Light Conditions

- Runoff characteristics of various species – most research is rye v. bentgrass or fescue v. bentgrass
- Sunlight – higher proportion of Kentucky bluegrass (50-60%) to fine fescue (40-50%)
- Partial sun to shade – higher proportion fine fescue (60%) to shade tolerant Kentucky bluegrass (40%)

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Above Ground:
Fertilize According to Traffic Conditions

- Fertilizer practices significantly affect runoff from turf
- Emphasize soil testing
- Apply P and K according to soil test
- Apply N based on use; Extension revising guidelines
  - High traffic area: 1 lb N/acre three times/year – latest by Labor Day
  - Low traffic area: 1 lb N/acre once/ year, in August or September by Labor Day

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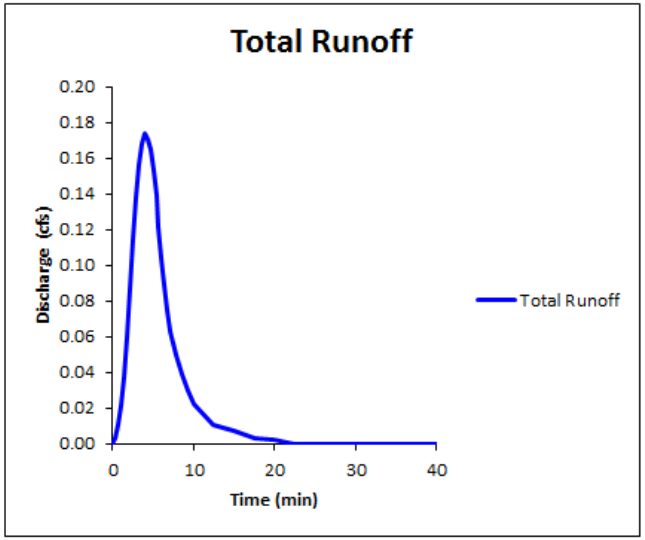
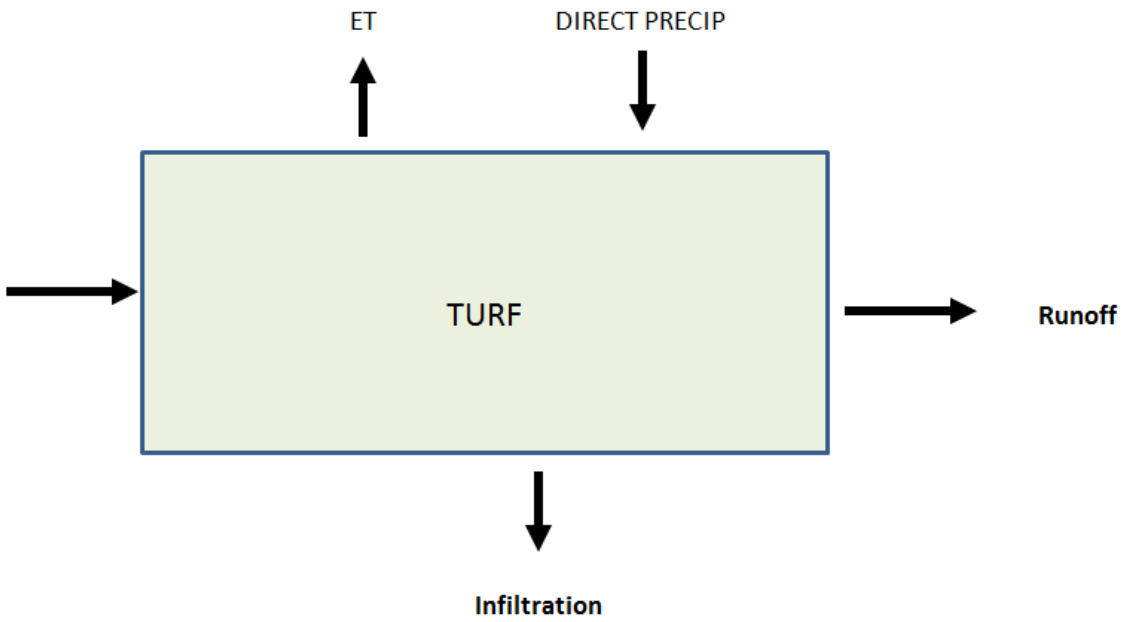
Quantifying Stormwater Benefits of Managing Turf for Stormwater

Impervious Runoff



Conceptual Model



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Turf Management Mini-Calculator

- Spreadsheet model
- Assumptions:
  - 1.1 inches rain over 30 min, 15 min
  - Amended soil acts as a reservoir with depth of 12”, void space of 30%, infiltration characteristics of A soil
  - Reservoir should draw down in less than 48 hours
  - Impervious surfaces are mildly sloped and distribute the runoff evenly across the BMP
  - BMP surface grade no greater than 1% to minimize overland flow velocity - velocities should be less than 1 fps

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User Inputs		
Paramter	Value	Units
Area of Impervious	670.6	Sq. ft.
Area of BMP	100.00	sq. ft

Impervious Surface Assumptions		
Length of flow path	36.6	ft
Curve Number	98	--
Slope	0.50	%

Output		
Total Available Volume of BMP Volume	45	Cu. Ft.
Total Total Storm Volume	45.00	Cu. Ft.
Total Volume Treated	45.00	Cu. Ft.
Excess Volume as Runoff	0.000	Cu. Ft.
Effective Stormwater Depth	5.4	inches
A Soils Total Drawdown Time	3.8	hours
B Soils Total Drawdown Time	12.2	hours
C Soils Total Drawdown Time	17.8	hours
D Soils Total Drawdown Time	30.95	hours

SOLVE
for Unknown BMP Size

Use this button to solve for the appropriate size BMP
For newly developed Impervious surfaces

SOLVE
For Unknown Impervious Surface

Use This button to solve for the amount of Impervious
Surface based on a known BMP size

1.1 inches,
15 minutes

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User Inputs		
Paramter	**Value**	**Units**
Area of Impervious	800.9	Sq. ft.
Area of BMP	100.00	sq. ft

Assumptions		
Length of flow path	40.02128822	ft
Curve Number	98	--
Slope	0.50	%

Output		
Total Available Volume of BMP Volume	**45**	**Cu. Ft**
Total Total Storm Volume	**45.00**	**Cu. Ft.**
Total Volume Treated	**45.00**	**Cu. Ft.**
Excess Volume as Runoff	**0.000**	**Cu. Ft.**
Effective Stormwater Depth	**5.4**	**inches**
A Soils Total Drawdown Time	**3.8**	**hours**
B Soils Total Drawdown Time	**12.2**	**hours**
C Soils Total Drawdown Time	**17.8**	**hours**
D Soils Total Drawdown Time	**30.95**	**hours**

SOLVE
for Unknown BMP Size

Use this button to solve for the appropriate size BMP For newly developed Impervious surfaces

SOLVE
For Unknown Impervious Surface

Use This button to solve for the amount of Impervious Surface based on a known BMP size

1.1 inches, 30 minutes

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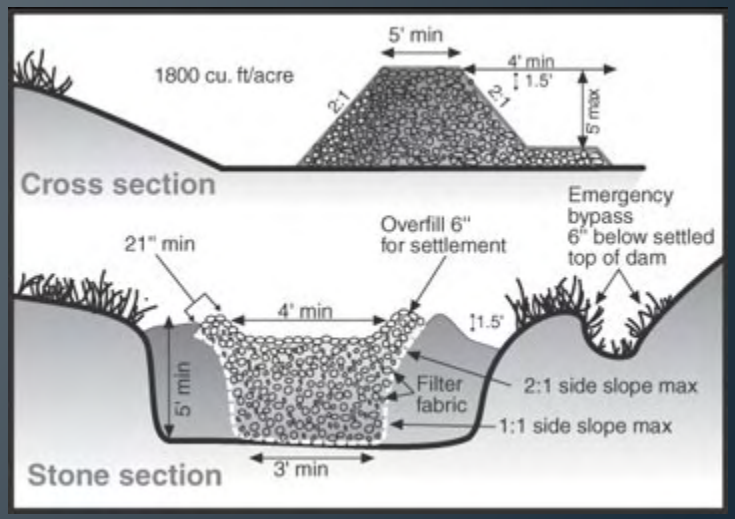
Pollutant Removal Performance

- 100% infiltration = 100% removal
- Partial infiltration
  - (100%)(volume removed) + (X%)(volume bypassed)
- Require pretreatment
  - Filter strips
  - Sediment traps



Questions for discussion

- Acceptance/inspection mechanism
- Enforcement of long term maintenance practices
- Should turf used for other stormwater BMPs be required to meet the same soil/turf maintenance practices?
- How to incentivize practice over all turfed areas?

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