Compost Used for Storm Water Management

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Outline

- Standard Specifications for 3 BMPs

(US EPA National Menu of BMPs)

- Why Specifications Matter
- Performance & Design

Compost Blanket Specifications

Parameters	Units of Measure	Surface to be Vegetated	Surface to be left Unvegetated
pH	pH units	5.0 – 8.5	N/A
Soluble salt concentration (electrical conductivity)	dS/m (mmhos/cm)	Maximum 5	Maximum 5
Moisture content	%, wet weight basis	30 – 60	30 – 60
Organic matter content	%, dry weight basis	25 – 65	25 – 100
Particle Size Distribution	% passing a selected mesh size, dry weight basis	- 3 in. (75 mm), 100% passing - 1 in. (25 mm), 90 – 100% passing - ¾ in. (19 mm), 65 – 100% passing - ¼ in. (6.4 mm), 0 – 75% passing Maximum particle length of 6 in (152 mm)	- 3 in. (75 mm), 100% passing - 1 in. (25 mm), 90 – 100% passing - ¾ in. (19 mm), 65 –100% passing - ¼ in. (6.4 mm), 0 – 75% passing Maximum particle length of 6 in (152 mm)
Stability Carbon dioxide	mg CO_2–C per g organic matter per	<8	N/A

Compost Filter Sock Specifications

Parameters	Units of Measure	Vegetated Filter Sock	Unvegetated Filter Sock
pH	pH units	5.0 – 8.5	6 – 8
Soluble salt concentration (electrical conductivity)	dS/m (mmhos/cm)	Maximum 5	Not applicable
Moisture content	%, wet weight basis	30 – 60	30 – 60
Organic matter content	%, dry weight basis	25 – 65	25 – 65
Particle size	% passing a selected mesh size, dry weight basis	- 3 in. (75 mm), 100% passing - 1 in. (25 mm), 90 – 100% passing - 0.75 in. (19 mm), 70 – 100% passing - 0.25 in. (6.4 mm), 30 – 75% passing Maximum particle size length of 6 in. (152 mm) Avoid compost with less than 30% fine particle (1 mm) to achieve optimum reduction of total suspended solids No more than 60% passing 0.25 in. (6.4 mm) in high rainfall/flow rate situations	- 2 in. (51 mm), 100% passing - 0.375 in. (10 mm), 10% – 30% passing
Stability Carbon dioxide evolution rate	mg CO_2-C per gram of organic matter per day	<8	<8
Physical contaminants	%, dry weight basis	<1	<1

Compost Filter Berm Specification

Parameters	Units of Measure	Berm to be Vegetated	Berm to be left Unvegetated
pH	pH units	5.0 - 8.5	Not applicable
Soluble salt concentration (electrical conductivity)	dS/m (mmhos/cm)	Maximum 5	Not applicable
Moisture content	%, wet weight basis	30 - 60	30 - 60
Organic matter content	%, dry weight basis	25 - 65	25 - 100
Particle size	% passing a selected mesh size, dry weight basis	- 3 in. (75 mm), 100% passing - 1 in. (25 mm), 90 . 100% passing - 0.75 in. (19 mm), 70 . 100% passing - 0.25 in. (6.4 mm), 30 . 75% passing Maximum particle size length of 6 in (152 mm) Avoid compost with less than 30% fine particle (1mm) to achieve optimum reduction of total suspended solids No more than 60% passing 0.25 in (6.4 mm) in high rainfall/flow rate situations	- 3 in. (75 mm), 100% passing - 1 in. (25 mm), 90 . 100% passing - 0.75 in. (19 mm), 70 . 100% passing - 0.25 in. (6.4 mm), 30 . 75% passing Maximum particle size length of 6 in (152 mm) Avoid compost with less than 30% fine particle (1mm) to achieve optimum reduction of total suspended solids No more than 60% passing 0.25 in (6.4 mm) in high rainfall/flow rate situations
Stability Carbon dioxide evolution rate	mg CO_2-C per gram of organic matter per day	<8	Not applicable
Physical contaminants (manmade inerts)	%, dry weight basis	<1	<1

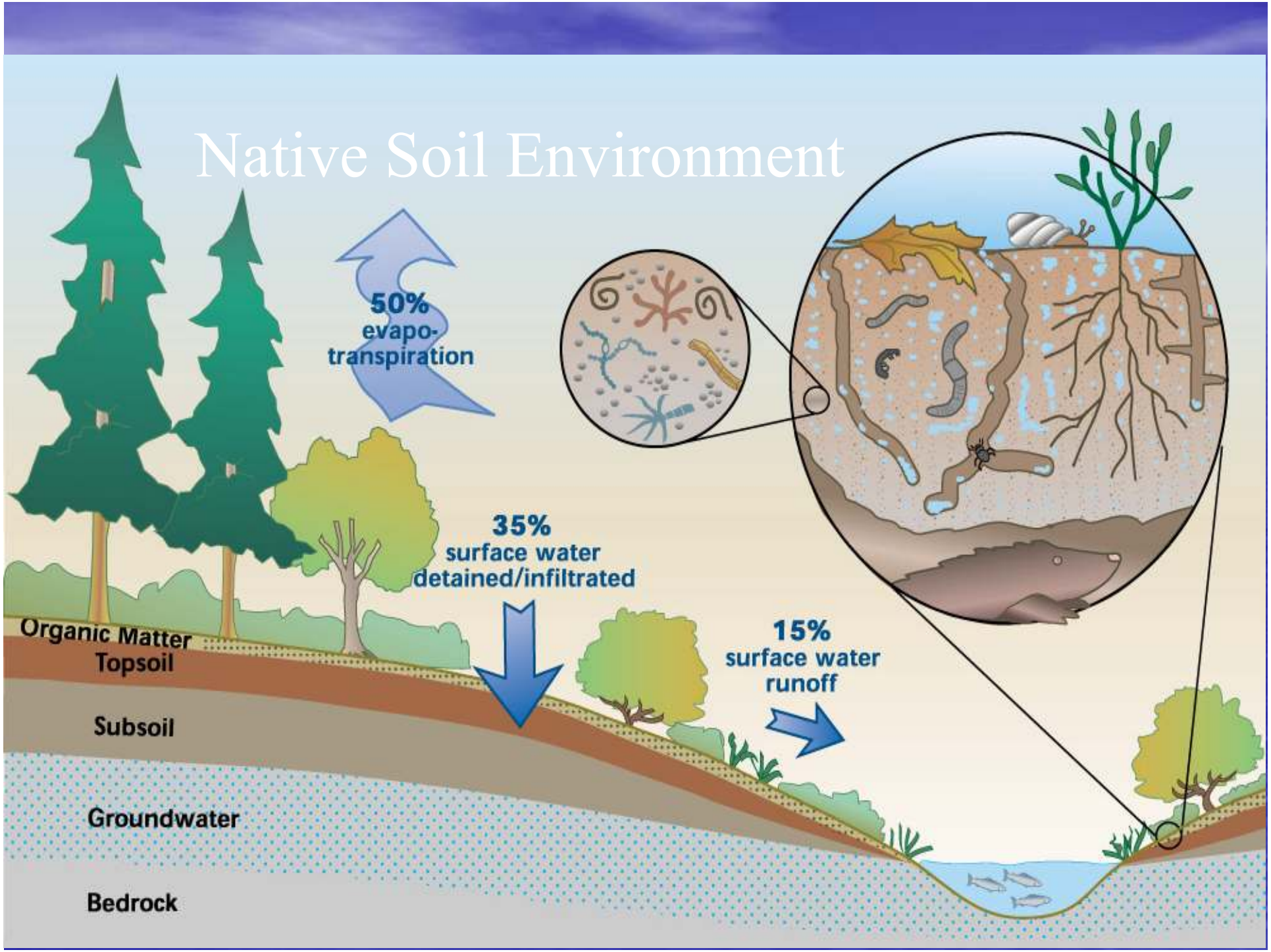
Particle Size Matters

Filter Sock/Berm:

Designed for Optimum Filtration & Hydraulic-flow

Compost Blanket:

Designed for Optimum Water Absorption & Plant Growth



Erosion Control/Slope Stabilization

Designed to: 1) dissipate energy of rain impact; 2) hold, infiltrate & evaporate water; 3) slow down/disperse energy of sheet flow; 4) provide for optimum vegetation growth

Turbidity (NTU)

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Average from 4 in Storm Event

Note: Straw w/ PAM is
GA DOT standard practice

2000
1500
1000
500
0

- 4.5 x

- 35 x

Straw /Pam

Compost-Coarse

Compost-Fine

The University of Georgia

Are Particle Size Specs Important?

Treatment	Soil Loss (kg ha^{-1})	TSS (kg ha^{-1})	Turbidity (NTU)	Particle size % passing		
				1 in	1/2 in	1/4 in
Compost 1	95.8	52.1	36	99	64	30
Compost 2*	129.2	60.4	60	99	85	67
Compost 3*	208.3	64.6	87	99	89	76
Compost 4**	408.3	283.3	288	99	99	95

*Did not meet TX DOT specification for erosion control compost particle size distribution.
**Did not meet TX DOT, USEPA, IN DNR, or CONEG specification for erosion control blanket particle size distribution

The University of Georgia

inwater Absorption

Runoff Volume Reduction

Reduction	Influencing Factors	Reference
49%	Sandy clay loam, 10% slope, 1.5" blanket, 3.2 in/hr – 1 hr rain	Faucette et al, 2005
60%	Sandy clay loam, 10% slope, 1.5" blanket, 4.0 in/hr – 1 hr rain	Faucette et al, 2007
76%	Silty sand, 2:1 slope, 3" blanket, 1.8 in/hr - 2.4 hr rain	Demars et al, 2000
90%	Loamy sand, 3:1 slope, 2" blanket, 4.0 in/hr – 2 hr	Persyn et al, 2004

Peak Flow Rate Reduction

Reduction	Influencing Factors	Reference
36%	Sandy clay loam, 10% slope, 1.5” blanket, 3.2 in/hr – 1 hr rain	Faucette et al, 2005
42% **(30% relative to straw)**	Sandy clay loam, 10% slope, 1.5” blanket, 4.0 in/hr – 1 hr rain	Faucette et al, 2007
79%	Loamy sand, 3:1 slope, 2” blanket, 4.0 in/hr – 2 hr rain	Persyn et al, 2004

Pollutant Load Reduction:

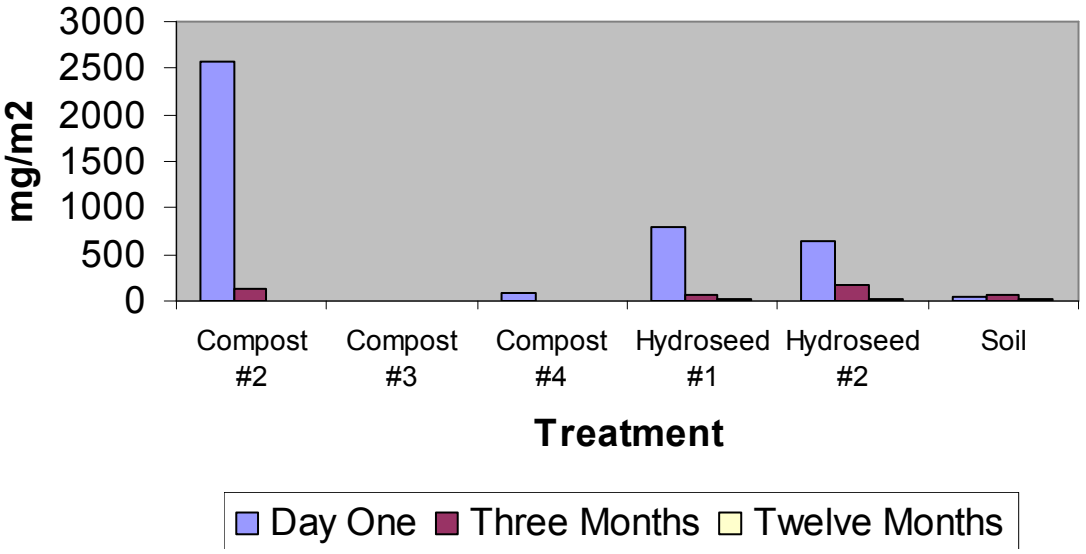
Compost Blanket vs Conventional Seeding

	Total N	Nitrate N	Total P	Soluble P	Total solids
Mukhtar et al, 2004 (seed+fertilizer)	88%	45%	87%	87%	99%
Faucette et al, 2007 (seed+fertilizer)	92%	ND	ND	97%	94%
Faucette et al, 2005 (hydromulch)	58%	98%	83%	83%	80%
Persyn et al 2004 (seed+topsoil)	99%	ND	99%	99%	96%

Compost Quality = Water Quality

Treatment	pH	Total N	NH_4-N	NO_3-N	Inorganic N
Compost #1	7.2	5980	70	240	5%
Compost #2	7.0	5830	**2480**	**1960**	**76%**
Compost #3	8.1	**8660**	140	180	4%
Compost #4	7.8	5010	40	70	2%

Units for N in mg kg^{-1}



Particle Size Matters

Filter Sock/Berm:

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Compost Blanket:

Designed for Optimum Water Absorption & Plant Growth

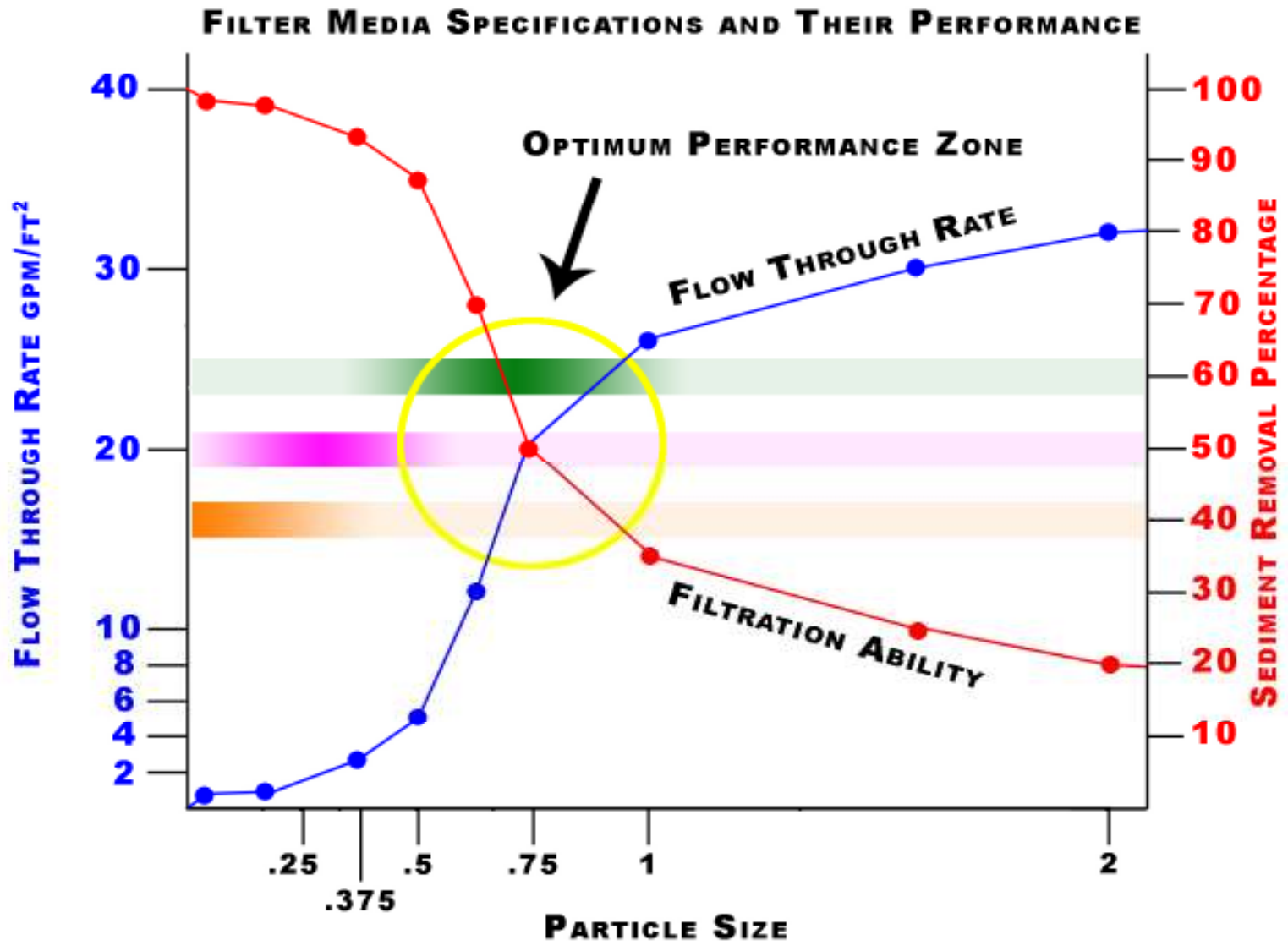
Filtration Devices use Filter Media







Does Particle Size Matter?



USDA ARS

Sediment Summary

% Reduction of TSS & Turbidity

Treatment	TSS	Turbidity
Silt Fence	67	52
Filter Sock	78	63

* Based on rainfall of 3.0 in/hr for 30 min; runoff sediment concentration (sandy clay loam) of 70,000 mg/L.

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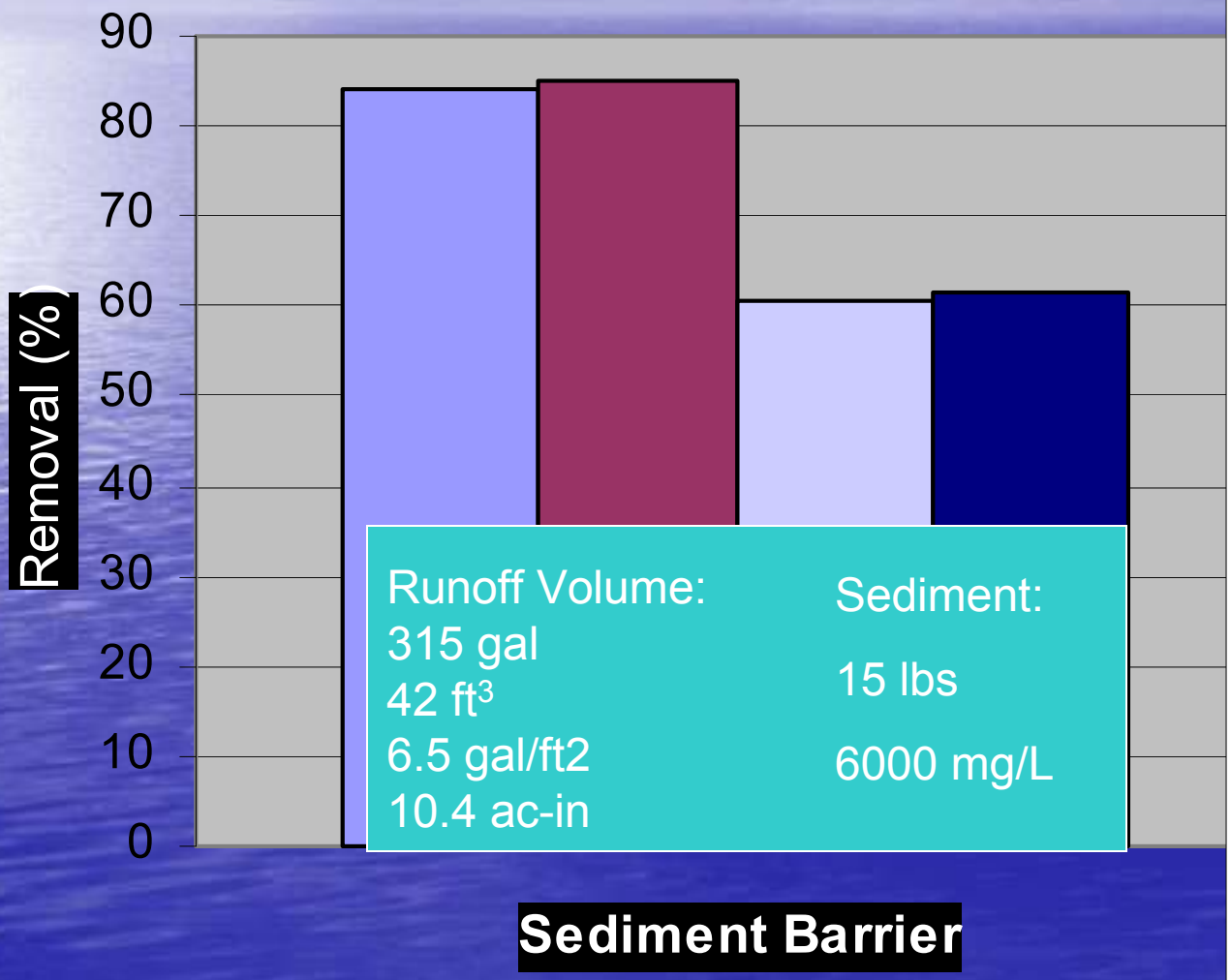
TSS Removal for Sediment Control Barriers



- 8" Compost Filter Sock
- 12" Compost Filter Sock
- Mulch Filter Berm
- Straw Bale

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	Runoff Exposure	Sediment Exposure	Removal
Filter Sock	•260 gal •1.7 g/ft^2 •2.75 ac-in	•850 lbs •150 lbs/ft^2 •125 t/a	77%
Silt Fence	•260 gal •1.7 g/ft^2 •2.75 ac-in	•850 lbs •150 lbs/ft^2 •125 t/a	72%
St	•260 gal	•850 lbs	58%

Sandy loam soil

ASTM 6459 for RECPs

Pollutant Removal from Storm water for Compost Socks

	TSS	Turb-idity	Total N	NH4-N	NO3-N	Total P	Sol. P	Total coli.	E. coli.	Metals	Oil	Diesel
Filter Sock	80 %	63 %	35 %	35 %	25 %	60 %	92 %	98 %	98 %	37-78 %	99 %	99 %

Faucette et al, 2008; Faucette et al, 2009

Hydraulic Design Capacity of Filter Socks & Silt Fence in Runoff Control Applications

H. Keener, B. Faucette, M. Klingman

- Flow through rates were **50%** greater for filter socks
- 12" Compost sock = 24" silt fence;
- 18" Compost sock = 36" silt fence

Design Criteria on Slopes

Slope	Slope Length (feet)	Sock Diameter (inches)
<50:1	250	12
50:1–10:1	125	12
10:1–5:1	100	12
3:1–2:1	50	18
>2:1	25	18

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