Research Update on Compost BMPs used for ES&P Control

Britt Faucette, Ph.D.
Research Ecologist/Director R&D

FILTREXX®
THE CERTIFIED STANDARD IN EROSION CONTROL

OUTLINE

- How & Why it works
- Research: Compost ECBs
- Research: Compost Filter Socks/Berms
- Take Home Messages

W&H PACIFIC

METRO
PEOPLE PLACES • OPEN SPACES

TCEQ

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

THE OHIO STATE UNIVERSITY
OARDC

DNR

SAN DIEGO STATE UNIVERSITY

1785
The University of Georgia

CONNECTICUT DEPARTMENT OF TRANSPORTATION

TxDOT

Woods End Research Laboratory, Inc.
AMERICA'S LEADER IN COMPOST QUALITY ANALYSIS

Iowa Department of Transportation

USDA ars

University of Connecticut

Colorado State University
Knowledge to Go Places

CAL POLY

IOWA STATE UNIVERSITY

Texas A&M UNIVERSITY

ANALYTICAL CHEMISTS and BACTERIOLOGISTS
Approved by State of California
SOIL CONTROL LAB
42 HANGAR WAY
WATSONVILLE
CALIFORNIA
95076
USA

EARTH ENVIRONMENTAL PARTNERS
CHANGING THE WAY THE WORLD GROWS

REXIUS
EROSION CONTROL SYSTEMS

THE UNIVERSITY OF TEXAS AT AUSTIN

MAINEDOT
Maine Department of Transportation

FILTREXX®
THE CERTIFIED STANDARD IN EROSION CONTROL

Erosion Control - ‘Prevention’
VS
Sediment Control – ‘Treatment’

Filter Media = Sediment Control

Designed for Optimum Filtration & Hydraulic-flow

Growing Media = Erosion Control

Designed for Optimum Water Absorption & Plant Growth

Specs/Certification is Key!

Training

Certification

Specifications

Performance Testing

Certification

PART I - Erosion Control

‘Soil Erosion Prevention’

EC/Slope Stabilization uses Growing Media

Compost *Storm Water* Blanket?

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

Journal of Soil and Water Conservation, Nov/Dec 2005

Evaluation of Storm Water from Compost and Conventional Erosion Control Practices in Construction Activities

Britt Faucette[1&2], C. Jordan[2], M. Risse[1], M. Cabrera[2], D. Coleman[2]
Dept. of Biological & Agricultural Engineering[1],
Institute of Ecology[2],
The University of Georgia, Athens, GA

The University of Georgia

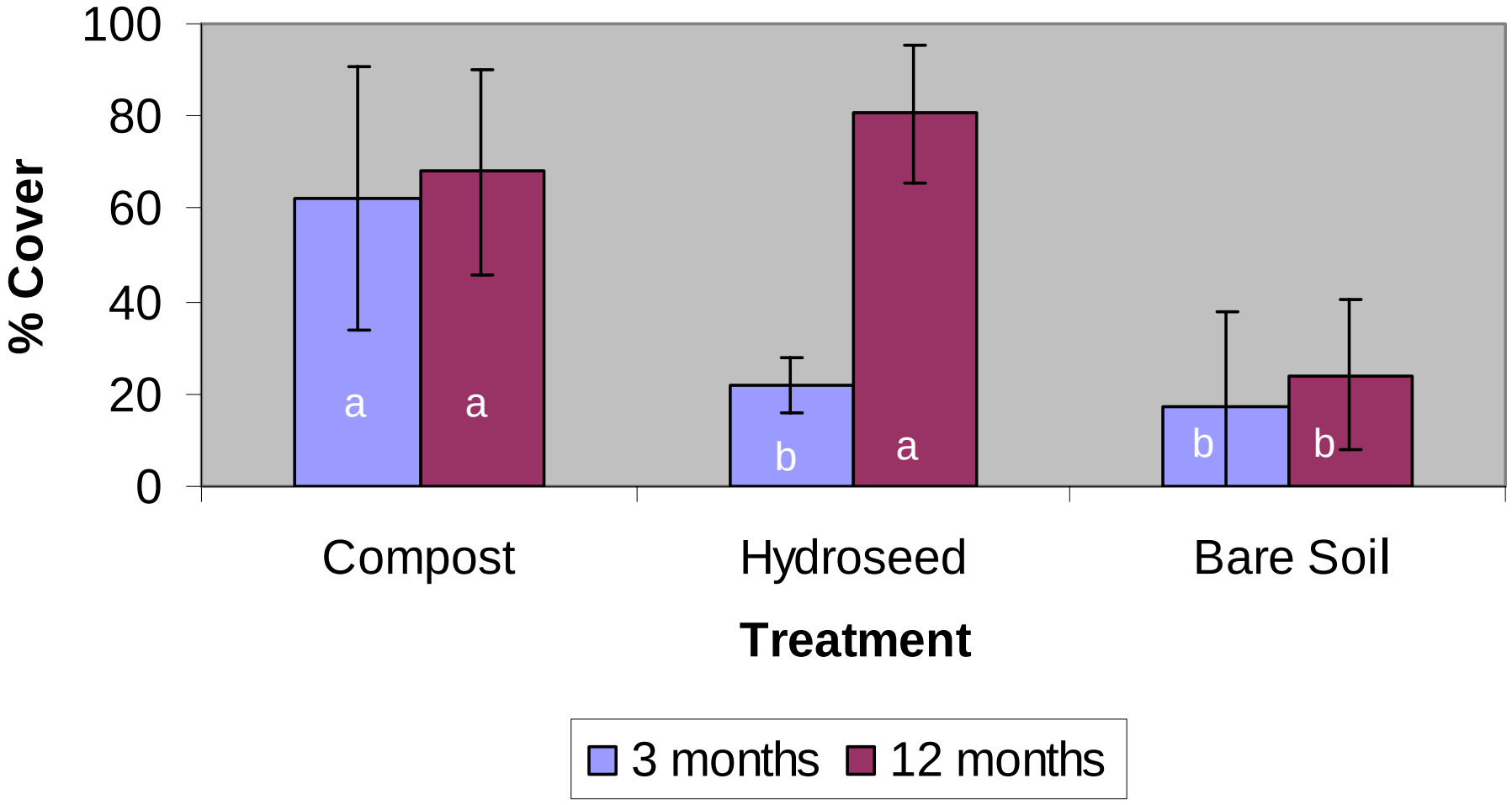
Objective

Evaluate the short and long term effects of compost compared to silt fence and hydroseed on storm runoff, soil erosion, nutrient loss, vegetative growth characteristics and soil quality.

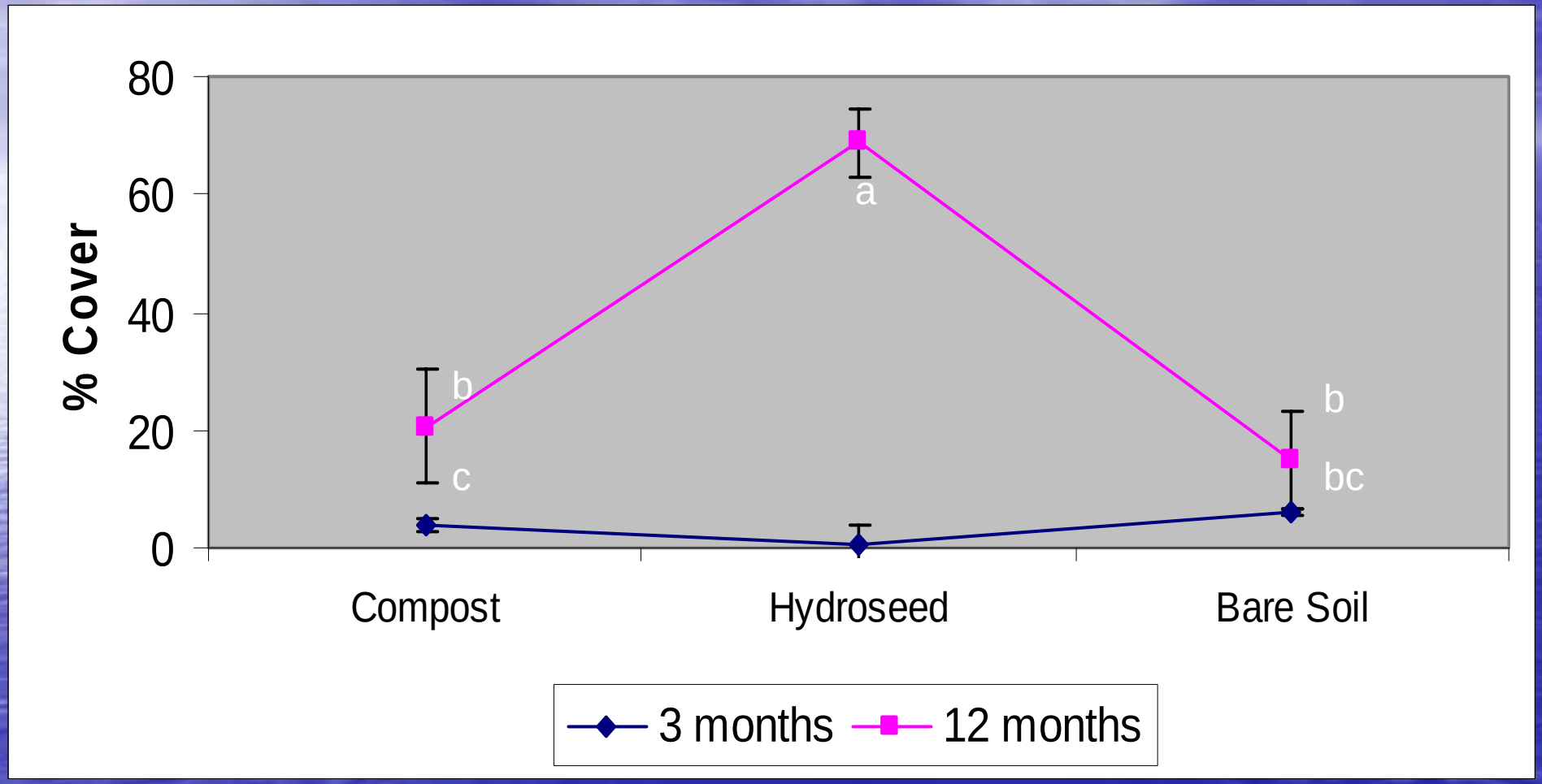
Experimental Design

- Blankets (1.5 in) & Filter Berms (1’ x 2’)
- Hydroseed applied by local professional
- DOT certified Class A silt fence
- Seeded w/ bermuda grass @ 20 lbs/ac (GDOT spec)
- 10% slope (cleared & graded)
- Plot size = 3’ wide x 16’ long
- Rainfall simulation = 3.1 in/hr for 1 hr = 50-yr/1-hr return for Athens, GA – worst case scenario
- 3 Storms = immediately after treatment application, 3 months, 12 months
- Soil sampling = day 1, 6 months, 18 months
- No supplemental irrigation

Vegetation Cover

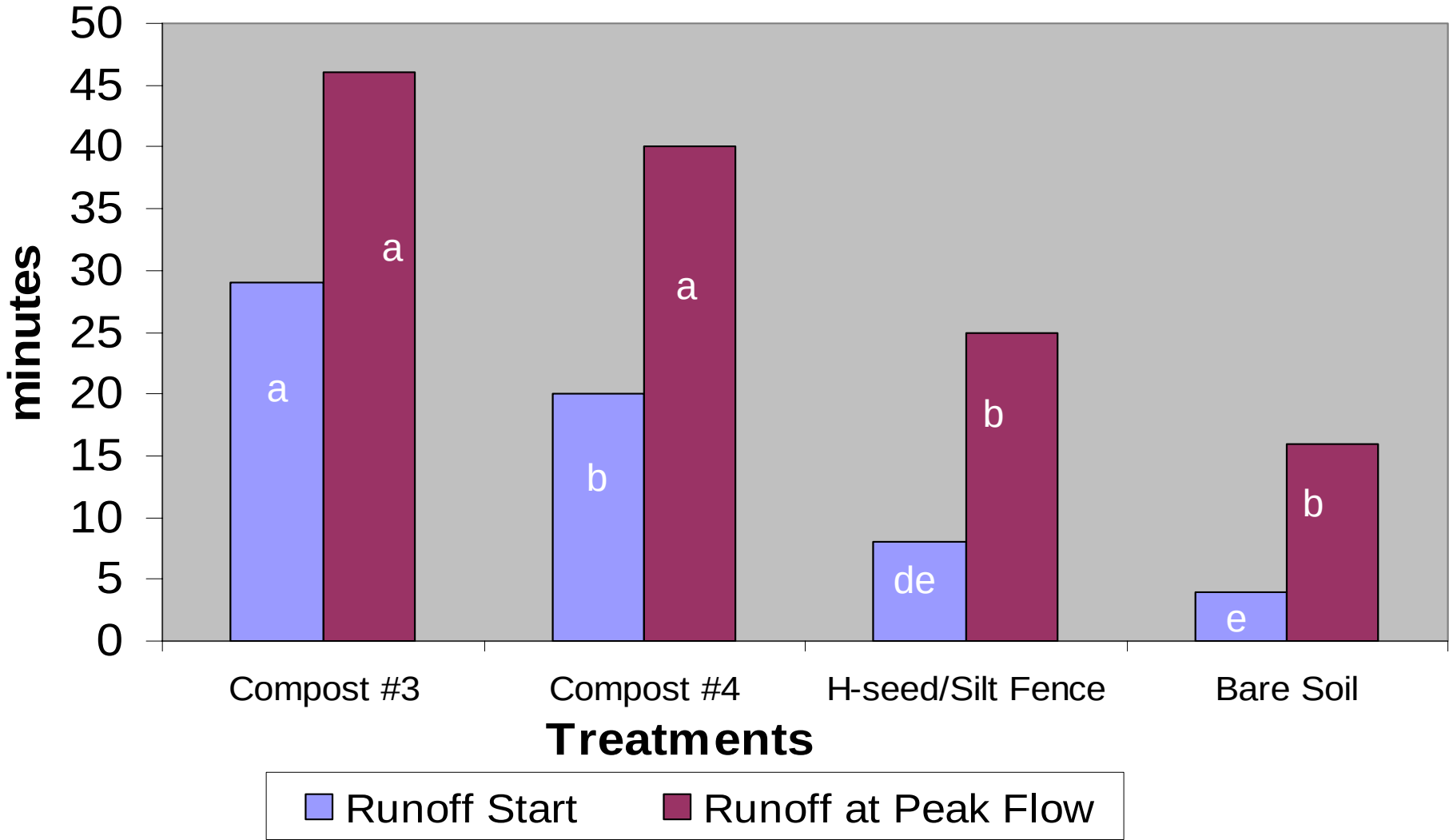


Invasive Weed Cover



*Weed Cover & Biomass positively correlated (r>0.85) to high <u>inorganic</u> N

Average Elapsed Time to Runoff Start & Peak Flow

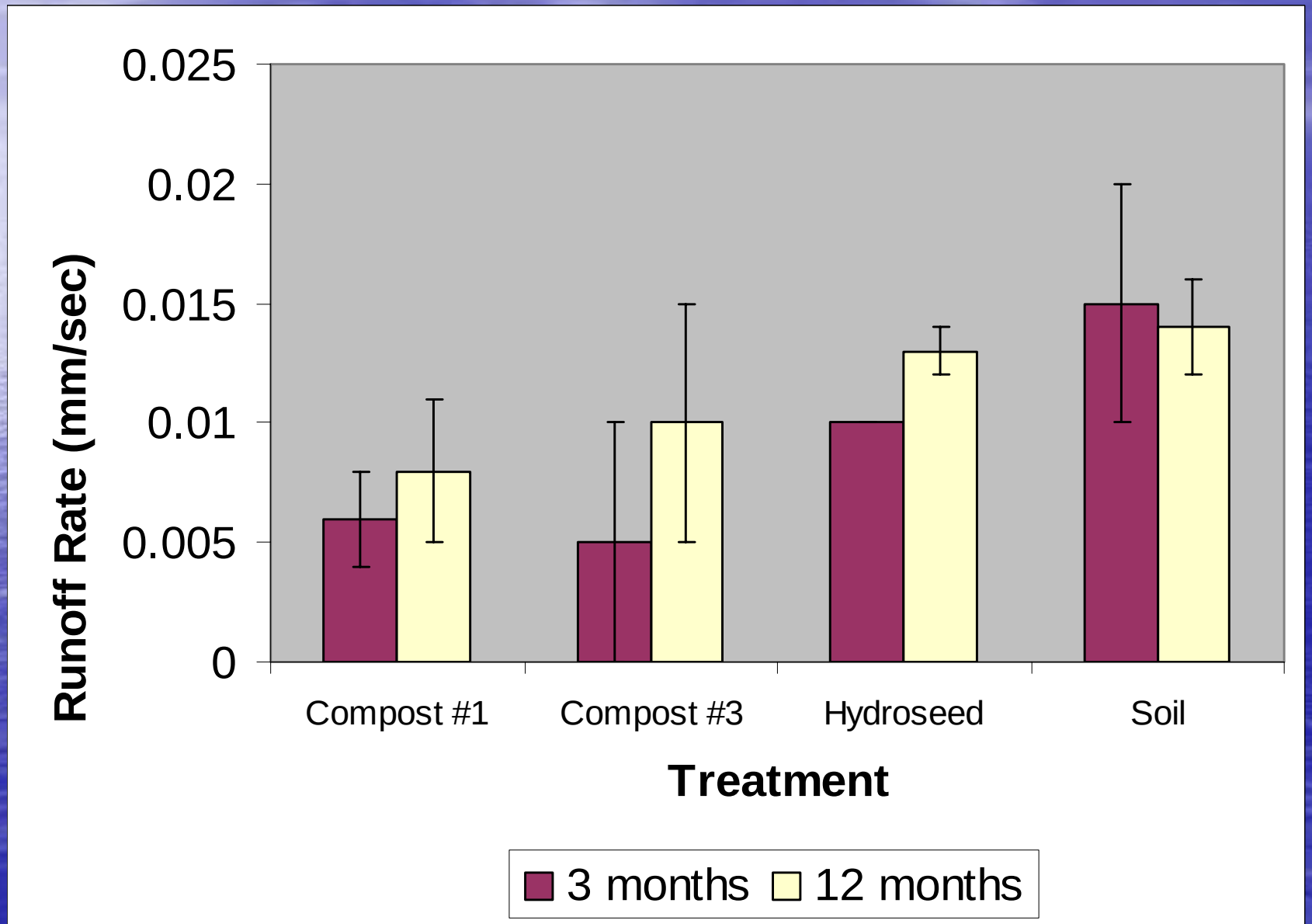


Runoff Volume (mm)

Compost ECB, Hydroseed, Bare Soil

	Day 1	Reduced	3 mo	Reduced	1 yr	Reduced
CECB	33	21%	8	83%	25	39%
Hydroseed	34	19%	26	43%	31	24%
Bare Soil	42		46		41	

Runoff Rate @ Peak Flow



Summary: Storm Runoff

Compost ECB vs Hydroseed

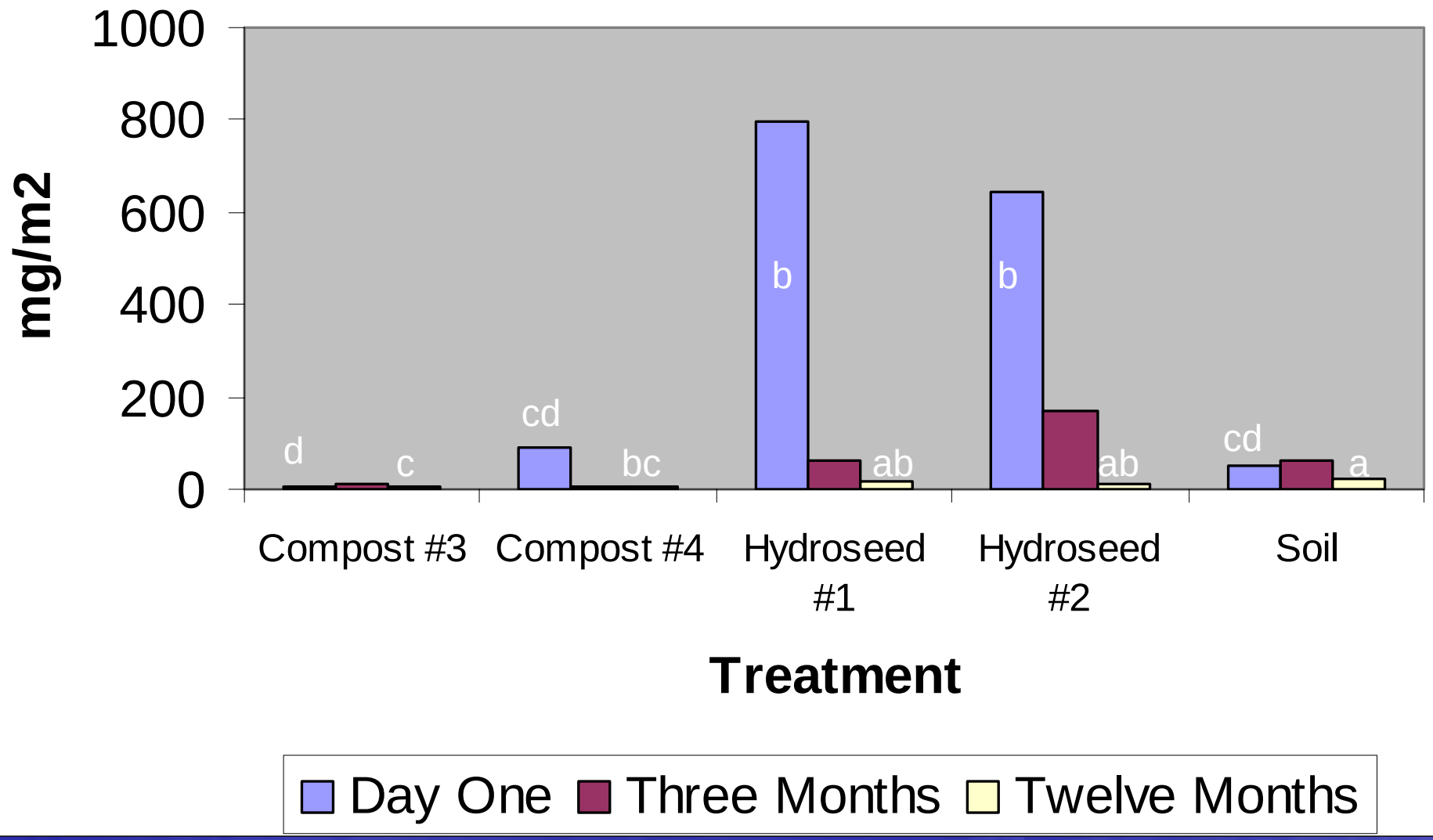
- ✓ Some compost ECBs produced *NO* runoff
- ✓ No runoff = little/no erosion (from transport)
- ✓ Greater time until start of runoff = no runoff for small & medium storm events
- ✓ Less runoff = smaller storm water management ponds/design areas = $$$$$

Summary: Total Solids Loss

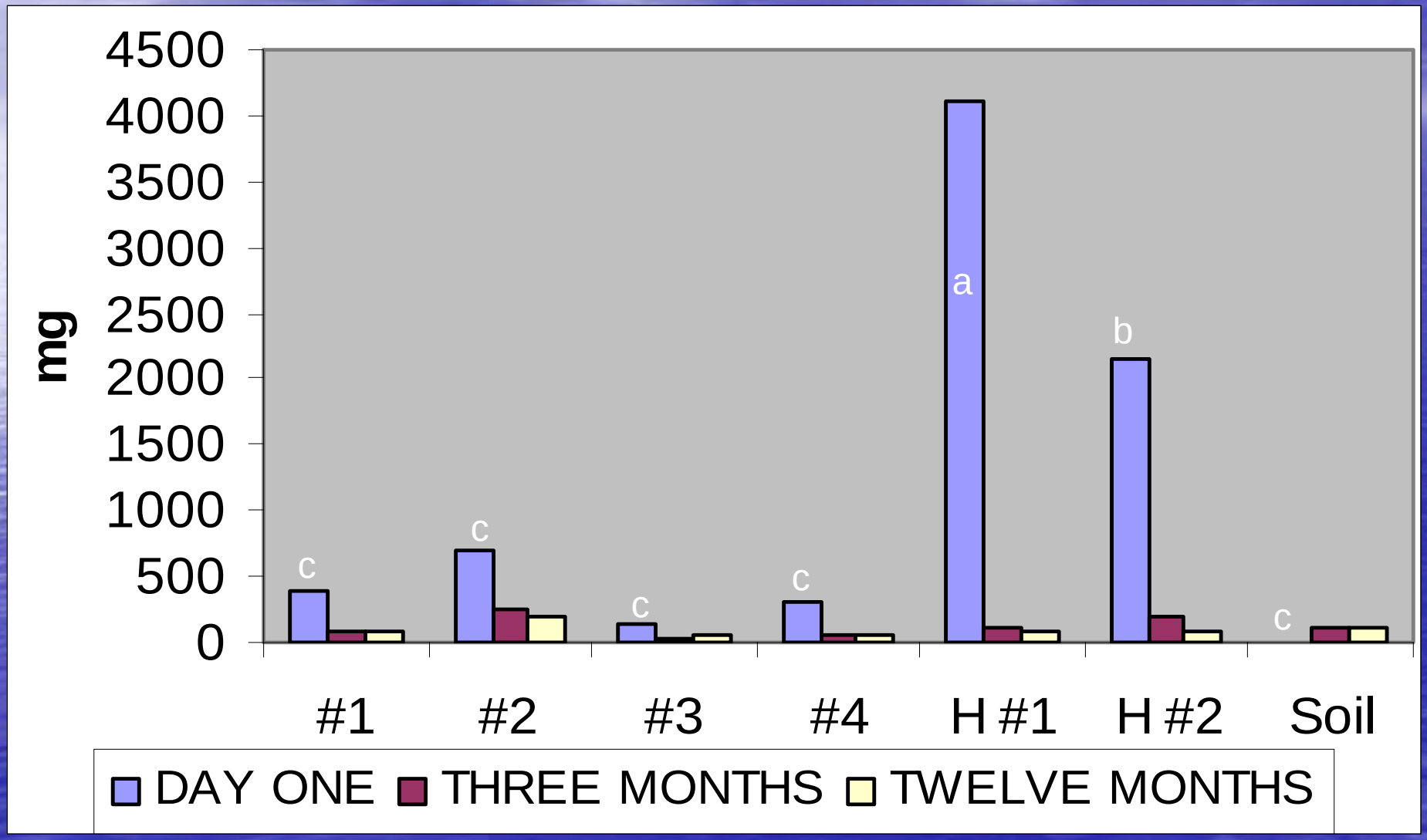
Hydroseed/silt fence vs Compost system for 3 storm events

- ✓Day 1 = **308 & 136 g/m^2**
- ✓3 mo = **220 & 13 g/m^2**
- ✓1 yr = **15 & 14 g/m^2**

Nitrate-N Load



Diss. Reactive P Load



WHAT IS THE TAKE HOME MESSAGE FROM THIS STUDY?

Compost Blanket Particle Size & Straw Mulch w/ PAM Affects on Water Quality, Water Quantity & C Factors

Britt Faucette[1], Jason Governo[2], Carl Jordan[2], B. Lockaby[3], H. Carino[3], R. Governo[3]

2 The University of Georgia

3

Funding assistance USDA

1 FILTREXX® THE CERTIFIED STANDARD IN EROSION CONTROL

Objectives:

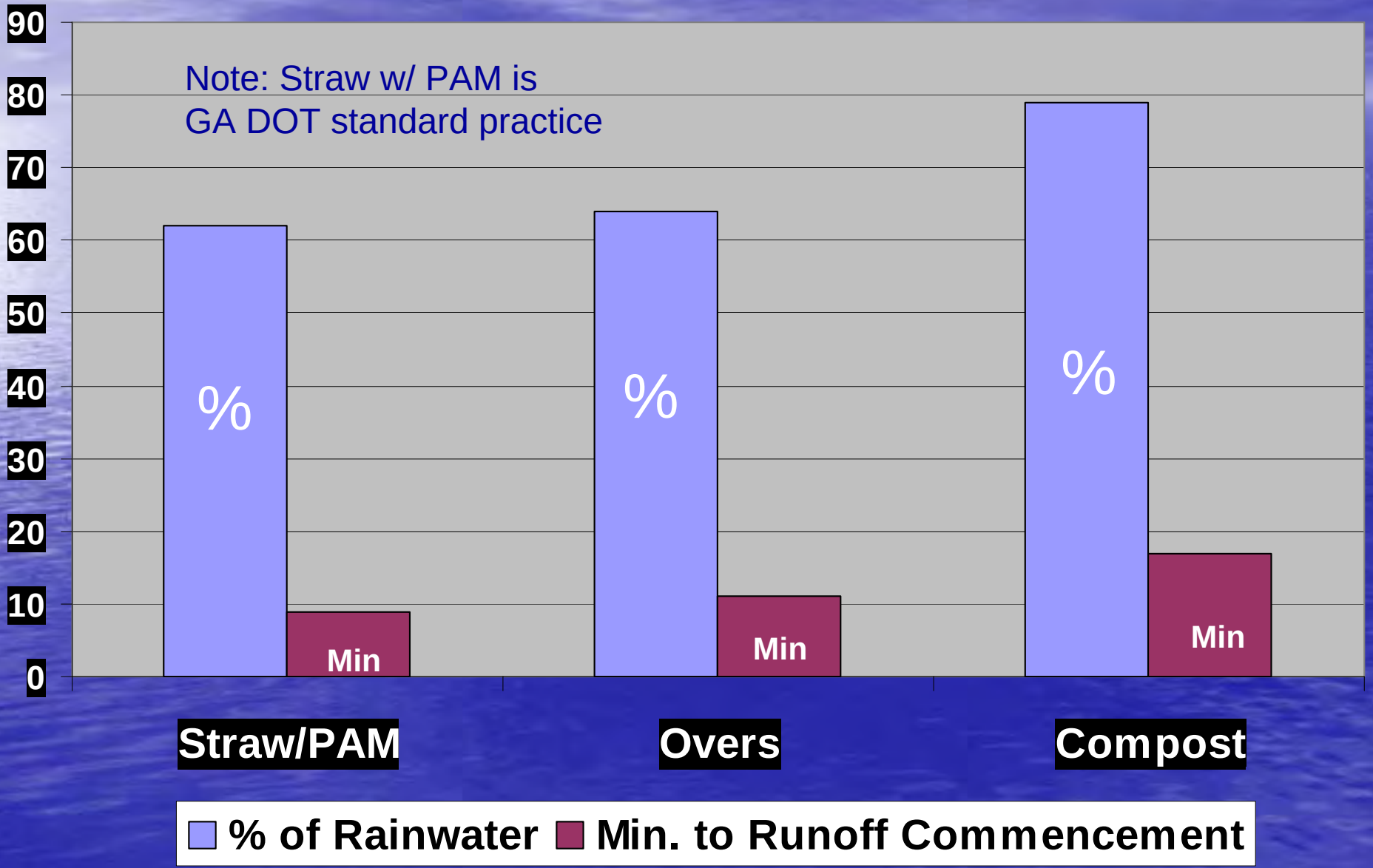
- Evaluate affect of particle size distribution on performance of Compost ECBs
- Compare performance of Compost ECBs to Straw Mulch w/PAM
- Evaluate performance of flocculants added to Compost ECBs for sediment reduction
- Determine RUSLE Cover (C) Factors for all treatments

Parameters:

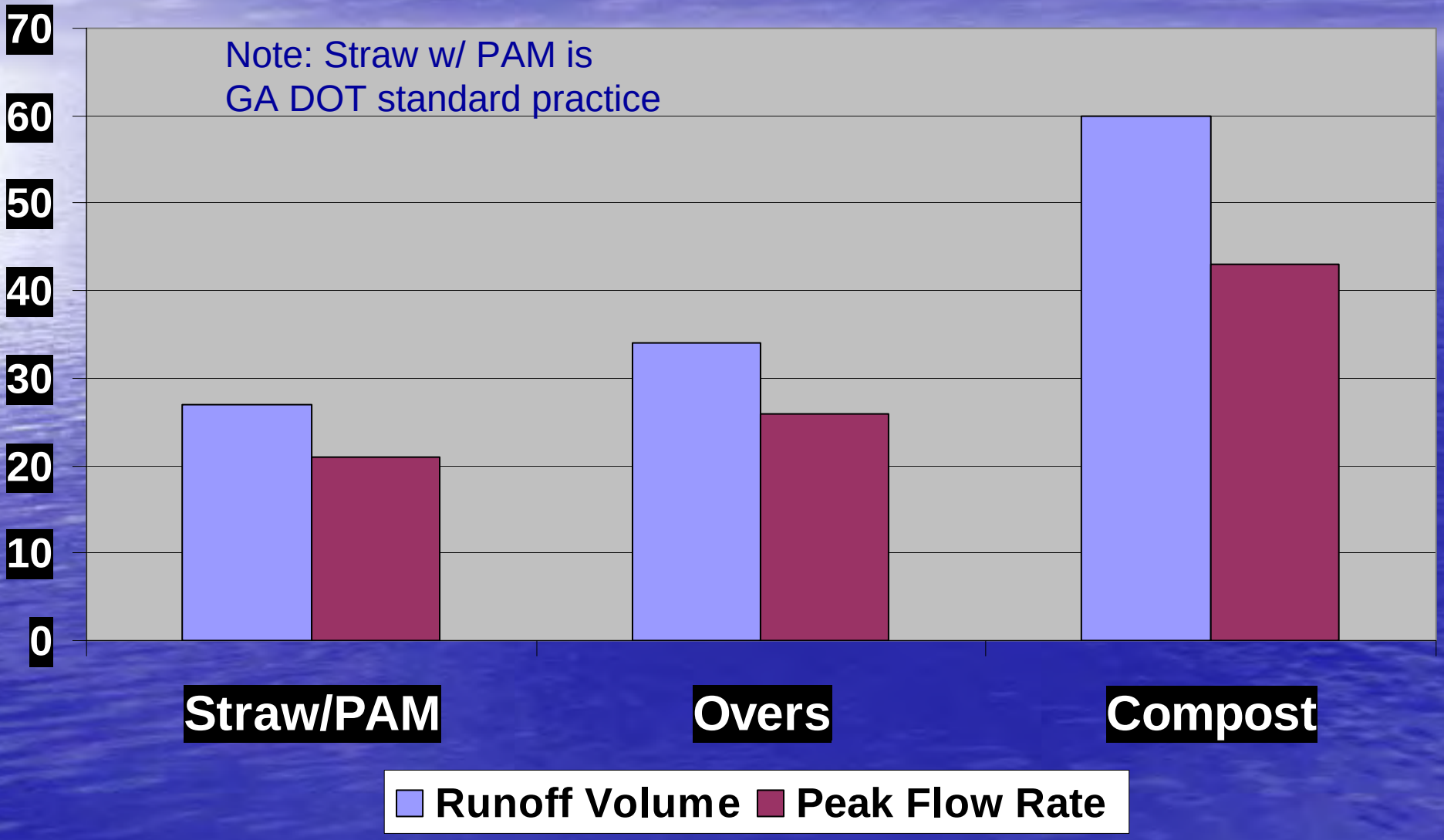
Storm Water Quality & Quantity: TS loading, TSS loading, Turbidity, N & P loading, runoff volume, peak runoff rate, time to runoff commencement & peak flow

Vegetation: % cover & biomass of weeds and EC grass

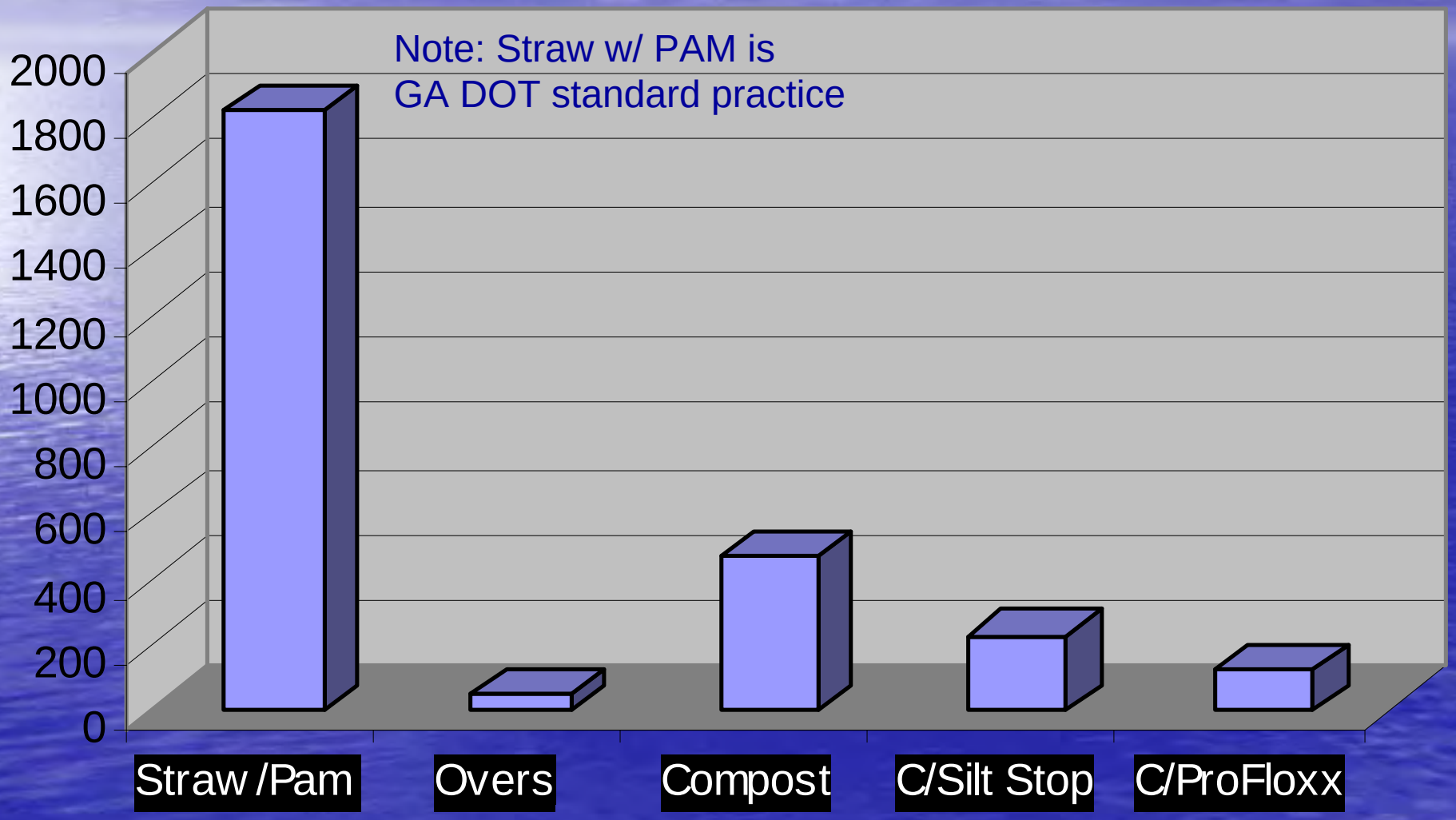
Rainwater Absorption



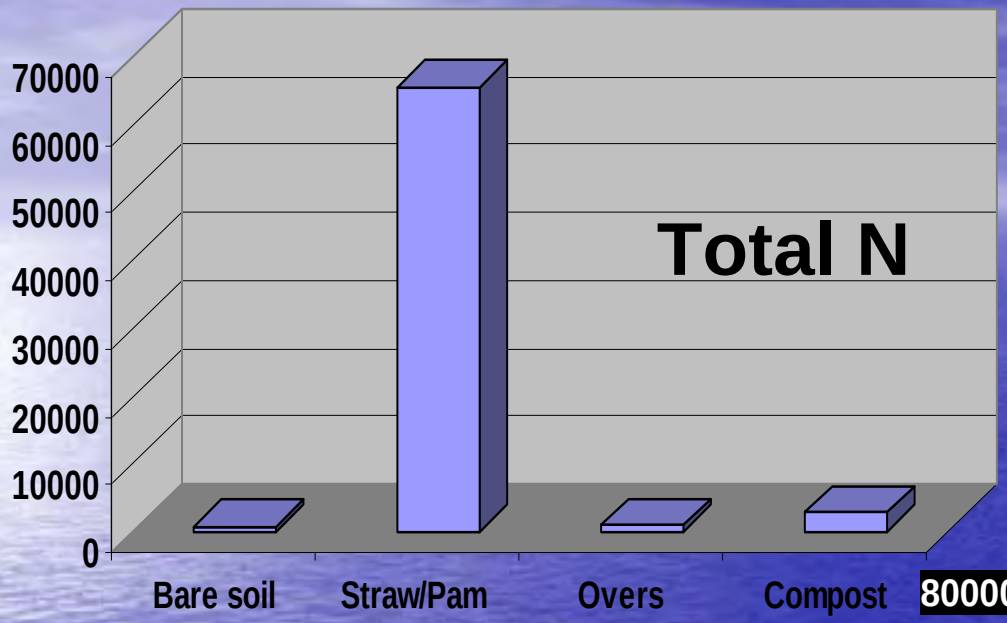
% Reduction of Storm Water Runoff

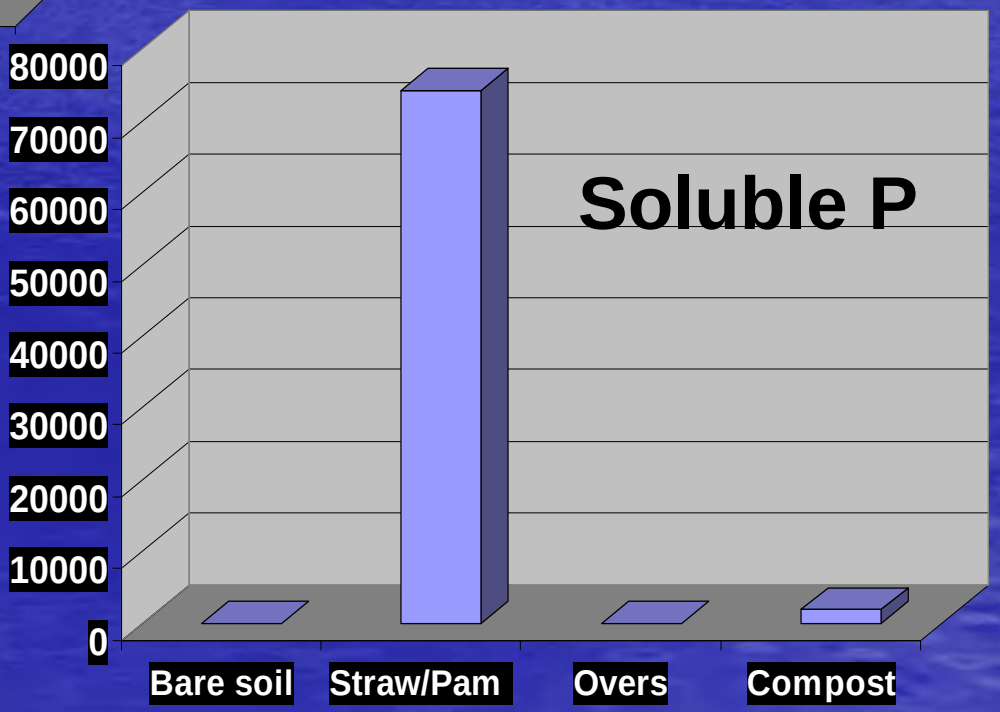


Turbidity (NTU) during Storm #1



Nutrient Loads (mg) for Storm #1





WHAT IS THE TAKE HOME MESSAGE FROM THIS STUDY?

PART II - Sediment Control

‘Storm Water Treatment’

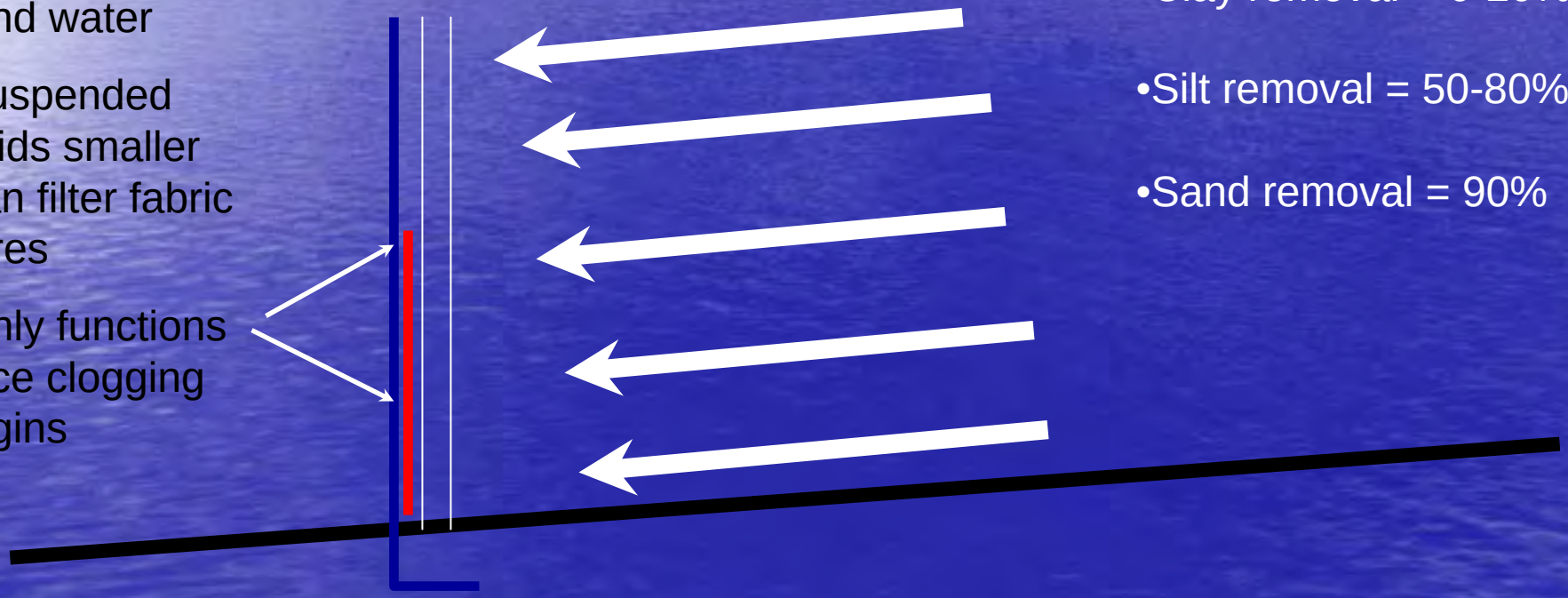
Filtration Devices use Filter Media

What's in that Sock? 3-Way Filtration

- Physical
  - Traps sediment in matrix of varying pore spaces and sizes
- Chemical
  - Binds and adsorbs nutrients/hydrocarbons in storm runoff
- Biological
  - Degrades various compounds with bacteria and fungi

Silt Fence Is a Single Membrane and Functions as Mini *Sediment Detention Pond*

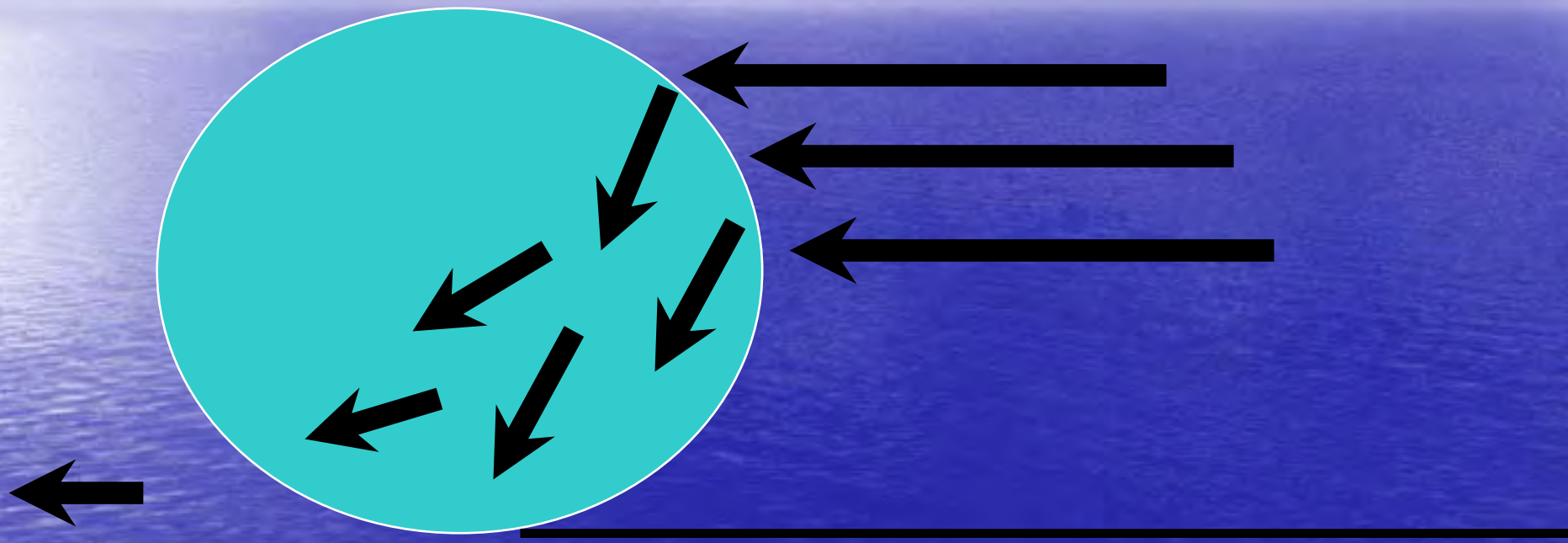
- Designed to pond water
- Suspended solids smaller than filter fabric pores
- Only functions once clogging begins



US EPA/NPDES

- Clay removal = 0-20%
- Silt removal = 50-80%
- Sand removal = 90%

Filter Socks Act as a 3 Dimensional *Filter*

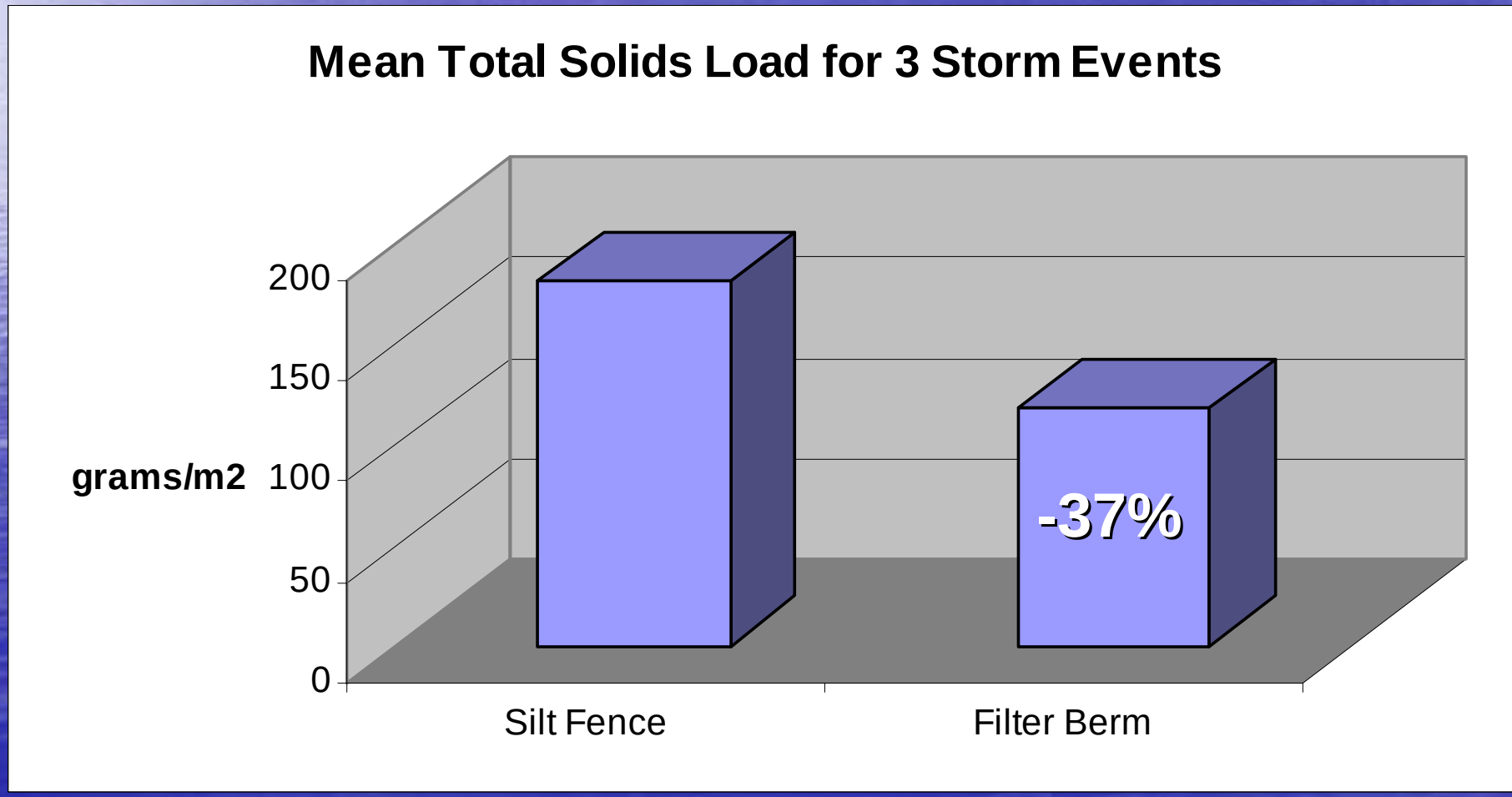


- Designed to flow water faster
- Mix of particle sizes (SPECS!) = micro & macro pores
- Humus = adsorption of soluble pollutants (+ charged)

Silt Fence vs Filter Berm

Journal of Soil & Water Conservation

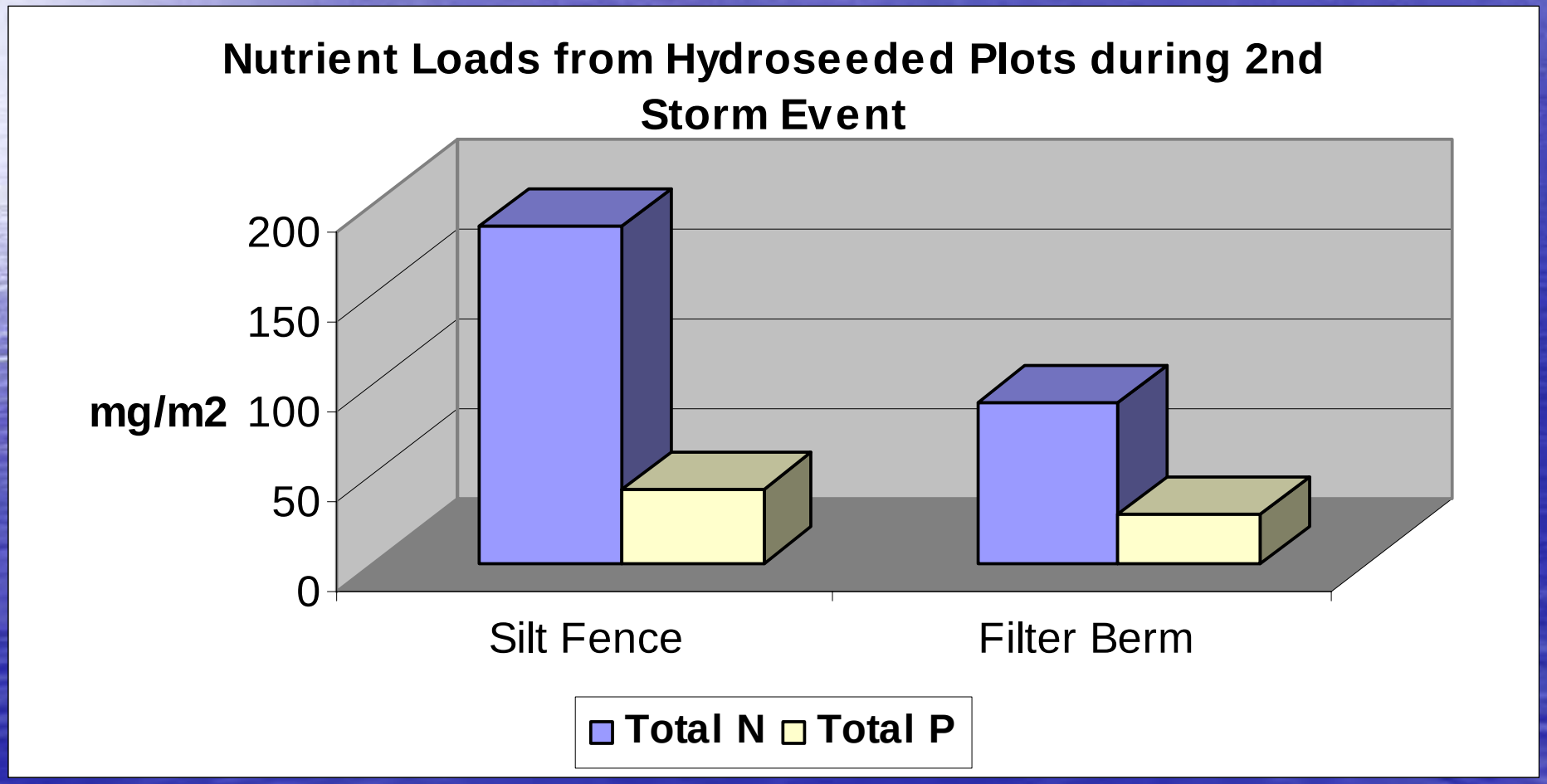
(Faucette et al., 2005)



Silt Fence vs Filter Berm

Journal of Soil & Water Conservation

(Faucette et al., 2005)



International Erosion Control Association – Annual Conference Proceedings, 2006; 2nd Interagency Conference on Research in Watersheds Proceedings, 2006

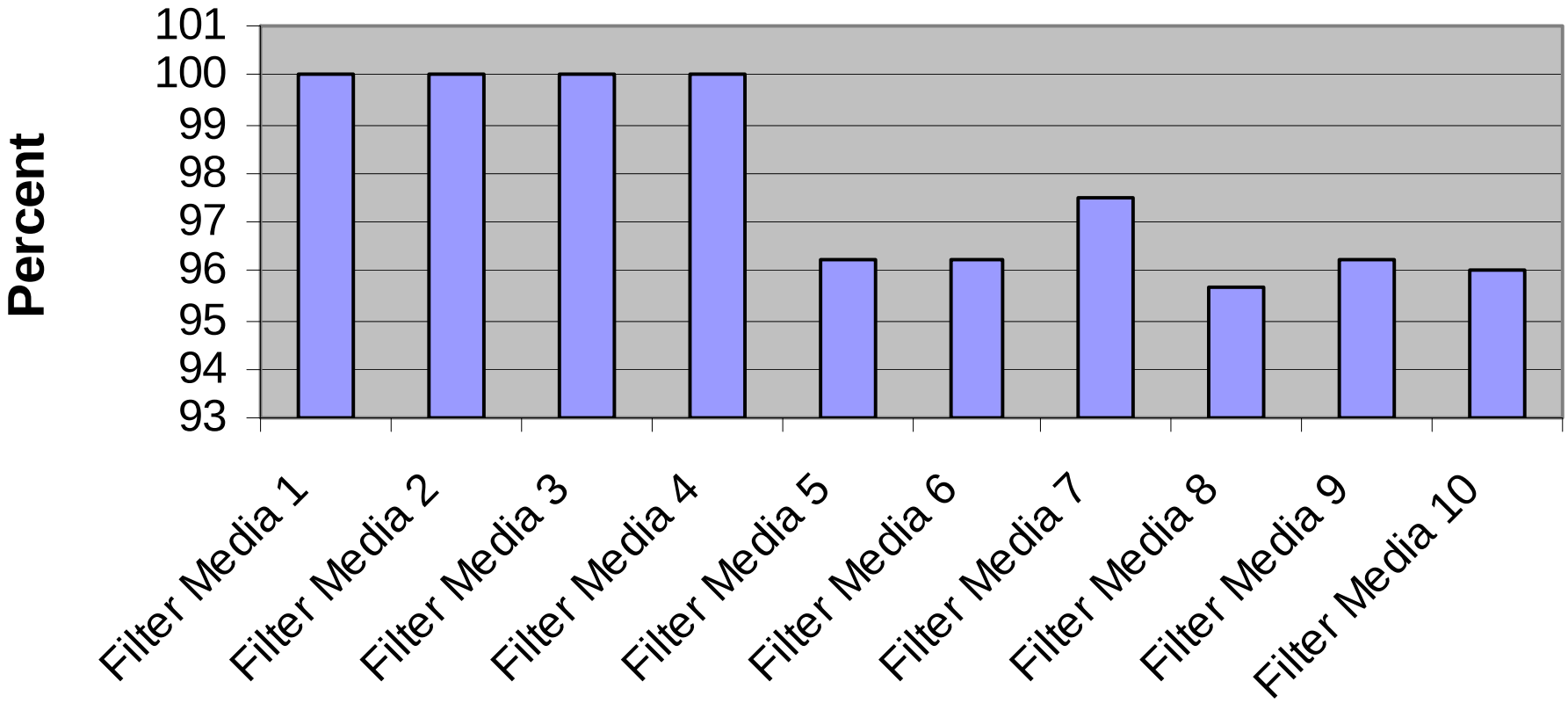
B. Faucette, F. Shields, K. Kurtz

ANALYTICAL CHEMISTS and BACTERIOLOGISTS
Approved by State of California
SOIL CONTROL LAB
42 HANGAR WAY
WATSONVILLE
CALIFORNIA
95076
USA

Performance Testing & Certification Lab for Filtrexx International

ANALYTICAL CHEMISTS and BACTERIOLOGISTS
Approved by State of California
SOIL CONTROL LAB
42 HANGAR WAY
WATSONVILLE
CALIFORNIA
95076
USA

Total Solids reduced

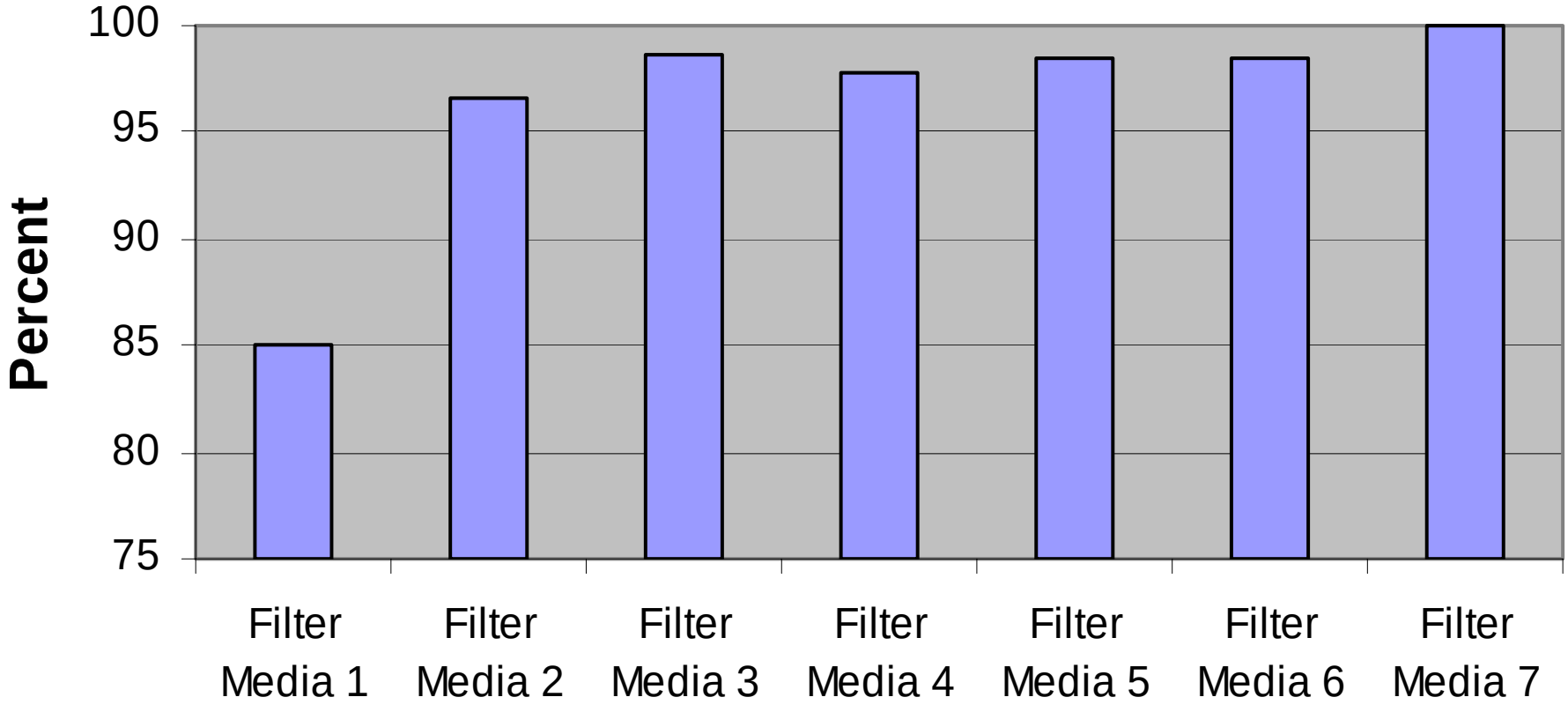


Turbidity Reduction w/ Filter Media™

Hydrocarbon & Spill Filtration

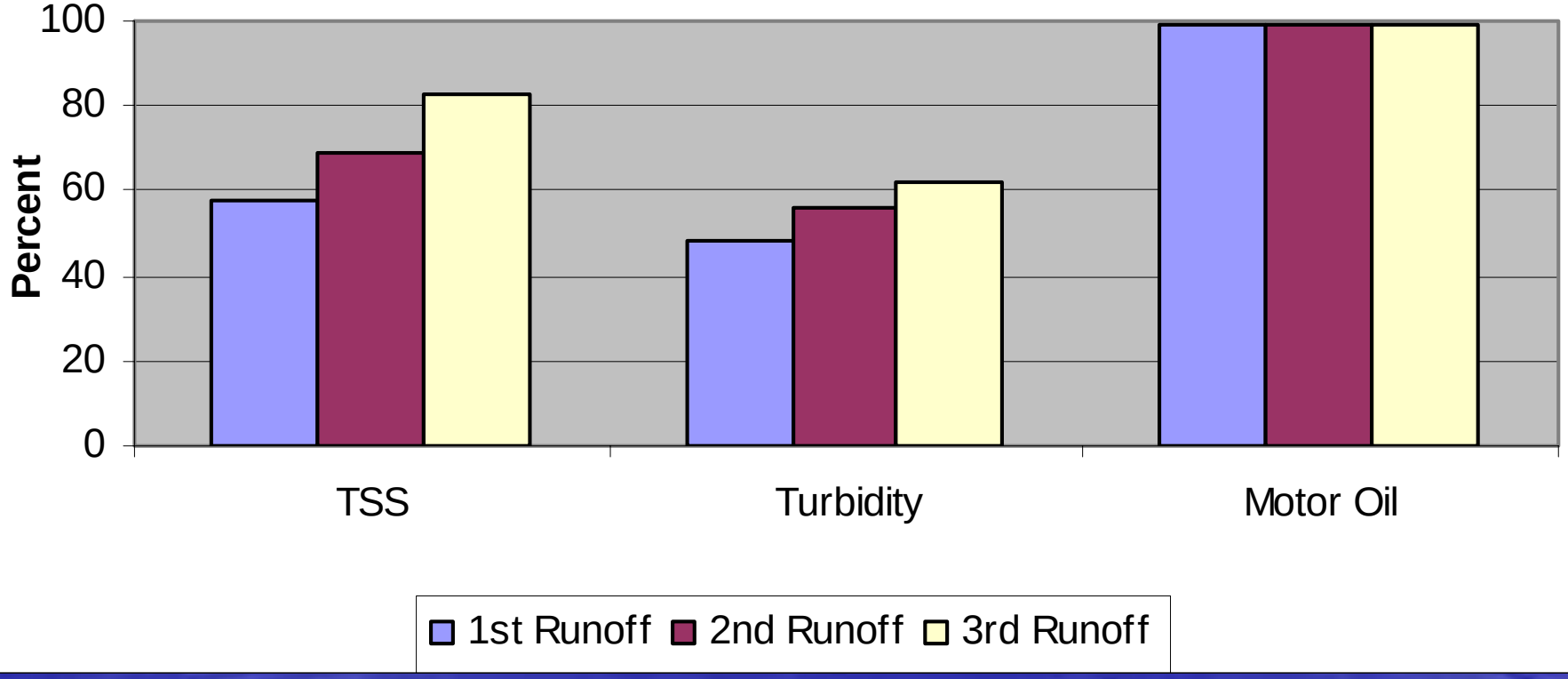
ANALYTICAL CHEMISTS and BACTERIOLOGISTS
Approved by State of California
SOIL CONTROL LAB
42 HANGAR WAY
WATSONVILLE
CALIFORNIA
95076
USA

Motor Oil Removal at 1,000-10,000 mg L



ANALYTICAL CHEMISTS and BACTERIOLOGISTS
Approved by State of California
SOIL CONTROL LAB
42 HANGAR WAY
WATSONVILLE
CALIFORNIA
95076
USA

TSS, Tubidity, Motor Oil Reduction for 3 Consecutive Runoff Events



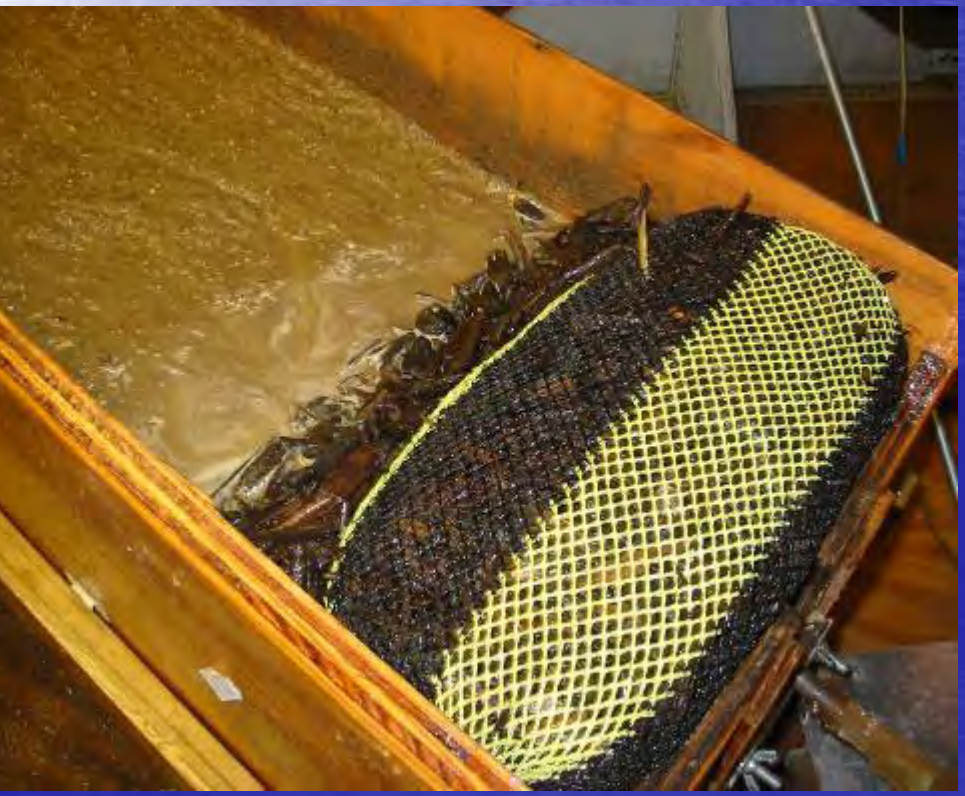
WHAT IS THE TAKE HOME MESSAGE FROM THIS STUDY?

International Meeting Paper, 2006

American Society of Agricultural and Biological Engineers

Sediment and Nutrient Removal from Storm Runoff with Compost Filter Socks and Silt Fence

A. Sadeghi, B. Faucette, K. Sefton



Compost Socks vs Silt Fence

50% Greater Flow Through Rate for Filter Soxx™

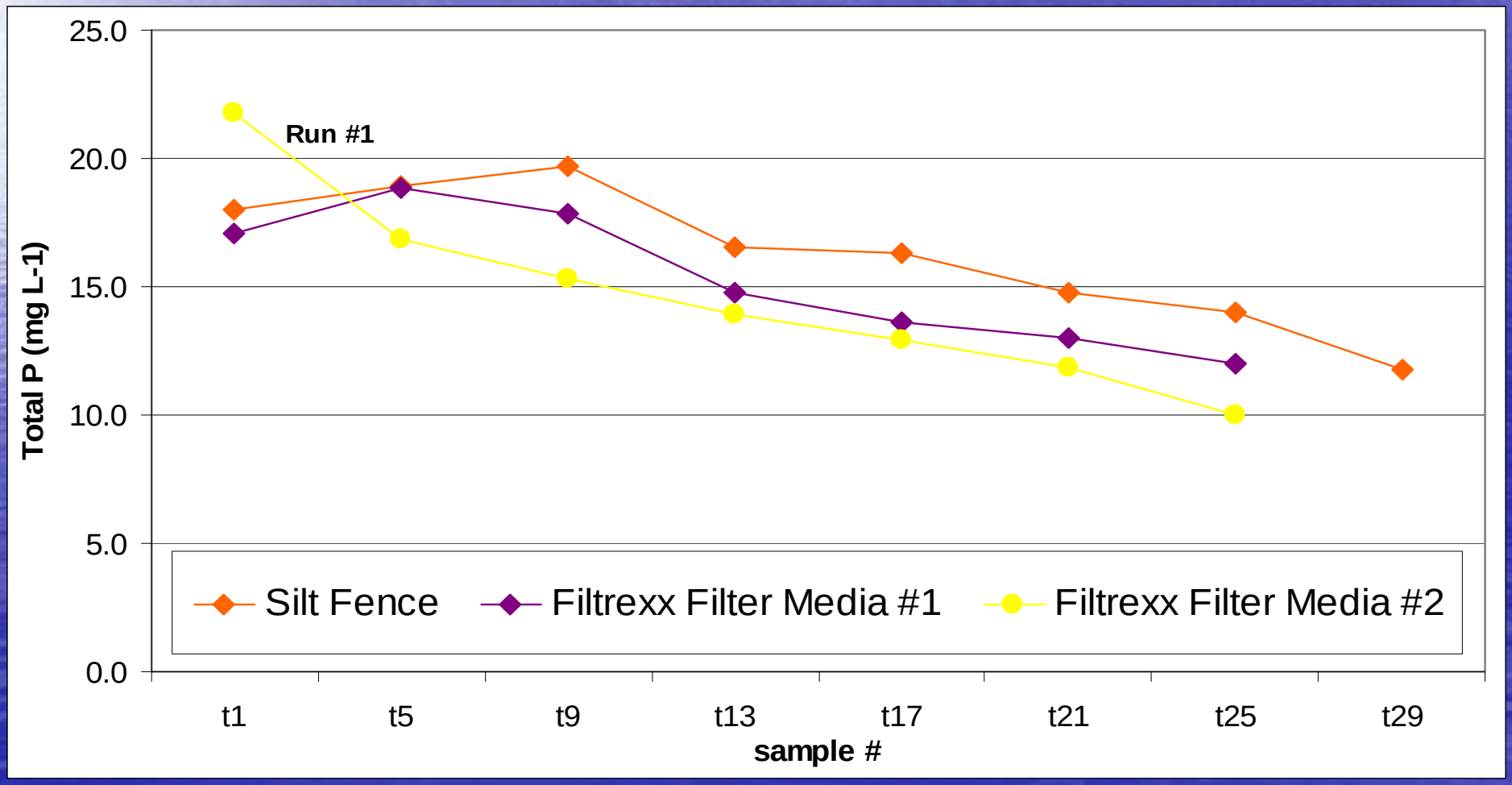
Sediment Summary

% Reduction of TSS & Turbidity of Silt Fence, Filter Soxx, Filter Soxx + Floc

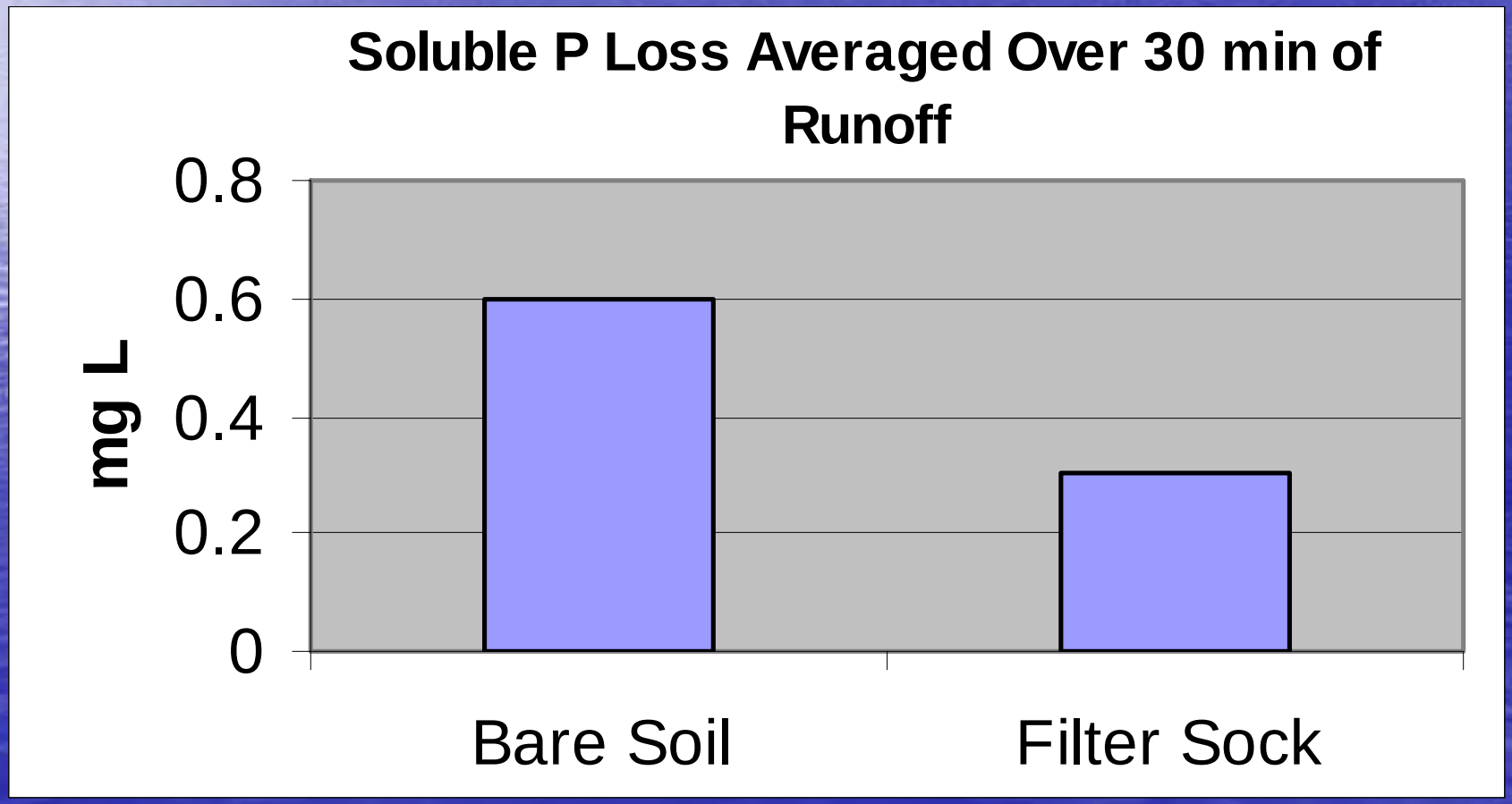
Treatment	TSS	Turbidity
Silt Fence	67	52
Filter Soxx	78	63
Filter Soxx + Pam 12	91	79
Filter Soxx + Silt Stop	97	98
Filter Soxx + BioFloxx	97	94

*** Total Solids removal efficiency for Filter Soxx = 90%**

Total Phosphorus



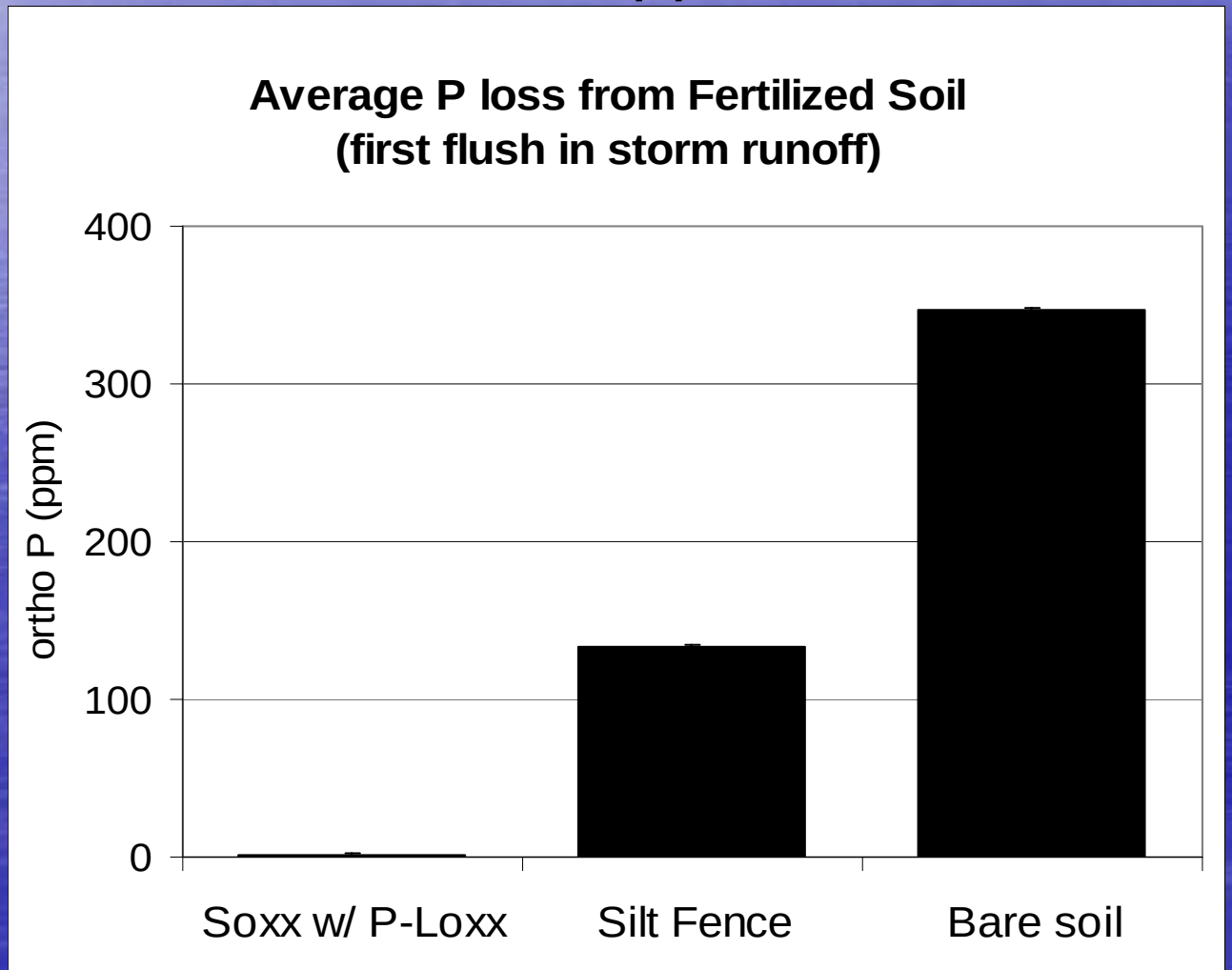
SOLUBLE P


Soluble P Loss Averaged Over 30 min of Runoff
mg L
0.8
0.6
0.4
0.2
0
Bare Soil
Filter Sock

Soluble P

Filter Soxx + P-Loxx = 99% reduction

NPK 25-27-5 Fertilizer Applied at 150 lbs/ac



WHAT IS THE TAKE HOME MESSAGE FROM THIS STUDY?

International Meeting Paper, 2006

American Society of Agricultural and Biological Engineers

Flow-Through Rate & Design Capacity of Compost Socks & Silt Fence in Sediment Control Applications

H. Keener, B. Faucette, M. Klingman

- Design capacity prediction model for Silt Soxx™ vs Silt Fence
- MS Excel™ based program
- Engineers, L.A.'s, E&SC/SWPPP Designers
- Inputs = storm intensity or total rainfall, storm duration, area of watershed, potential runoff reduction, slope length & degree, length of filter, ht/diameter of filter
- Outputs = Y/N failure, time to failure

Results: Design Capacity

- Avg flow rates were 50% greater for filter socks
- Ponding height as much as 75% greater for silt fence

- < 5 gpm/linear ft: 8” Silt Soxx™ = 24” silt fence;
  12” Silt Soxx™ > 36” silt fence
- > 5 gpm/linear ft: 12” Silt Soxx™ = 36” silt fence;
  18” Silt Soxx™ > 36” silt fence

SO WHAT?

1. Higher flow rate = higher design capacity = greater drainage area;
2. Greater drainage area = <u>less BMP installation/inspection/maintenance</u>,;
3. <u>Less cost to contractor and/or inspectors</u>

*Based on 30 min. of flow with sediment concentration at 10,000 mg L^{-1}

WHAT IS THE TAKE HOME MESSAGE FROM THIS STUDY?

Britt Faucette, Ph.D., Research Ecologist,

National Director R&D/
Technical & Environmental Assistance

FILTREXX®
THE CERTIFIED STANDARD IN EROSION CONTROL

Ph: 678 592 7094
brittf@filtrexx.com

www.filtrexx.com