Using Compost to control Runoff, Erosion, and Nutrient Losses

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Typical Erosion Control:

- Straw, hydroseeding, blankets, silt fences
  - somewhat effective when properly used
  - does little to improve soil quality
- Compost and mulch blankets could be effective
  - market for wastes
  - could improve vegetation and soil quality

Sediment from Soil Erosion

- Important Water Quality Issue
  - carries other pollutants
  - turbidity and aquatic health
  - sedimentation in reservoirs
- Sources include:
  - construction, NPDES permits
  - roads
  - agriculture

Literature Review

- Surface applied organic mulches to protect the soil surface can significantly reduce both runoff and soil erosion (Adams, 1966; Meyer et al., 1972; Laflen et al., 1978; Vleeschauwer et al., 1978; Foster et al., 1985; Agassi et al., 1998).
- Dissipate raindrop impact, reduce crusting, increase roughness, lower shear forces
- Many reports on compost use, little science...

OBJECTIVES

- to develop a better understanding of the characteristics of composts and mulches as related to their use as erosion control blankets.
  - to test the effectiveness of various compost and mulch materials used as blankets in reducing sediment and nutrient losses
  - to correlate the physical and chemical properties of the materials to the measured losses.

Methods

- Phase 1: Simulator Pan Study looking at erodibility
- Phase 2: Pot study looking at grass growth
- Phase 3: Treatments with most potential field tested with natural rainfall and using berms.
- Extension: Gotta have demos…

Phase 1:Treatments

Name	*Description/Primary Feedstocks*	*Reps*
PLC1	Poultry Gold Compost/PL	2
PLC2	Sargents Nutrients/PL	2
PLC3	Gro-mor Organics/PL, Vegetable culls, yard waste	1
PL	Aged Poultry Litter/ Layer manure	2
MSC	Cobb Co. Compost/ MSW Compost, biosolids	2
BSC	Erthfood compost/Biosolids, peanuts hulls	3
FWC	Creative Earth/Food residuals, wood waste	2
YWC	UGACompost/Yard & wood waste, some manure	3
WMf	Woodtech Superfine Mulch/Fine wood mulch	2
WMm	Woodtech Medium hardwood mulch	3
WM2	Rockdale Co. Mulch/Course ground waste wood	2
Soil	Bare Soil Control/ screened	3

Treatment selection based on availability in Georgia.

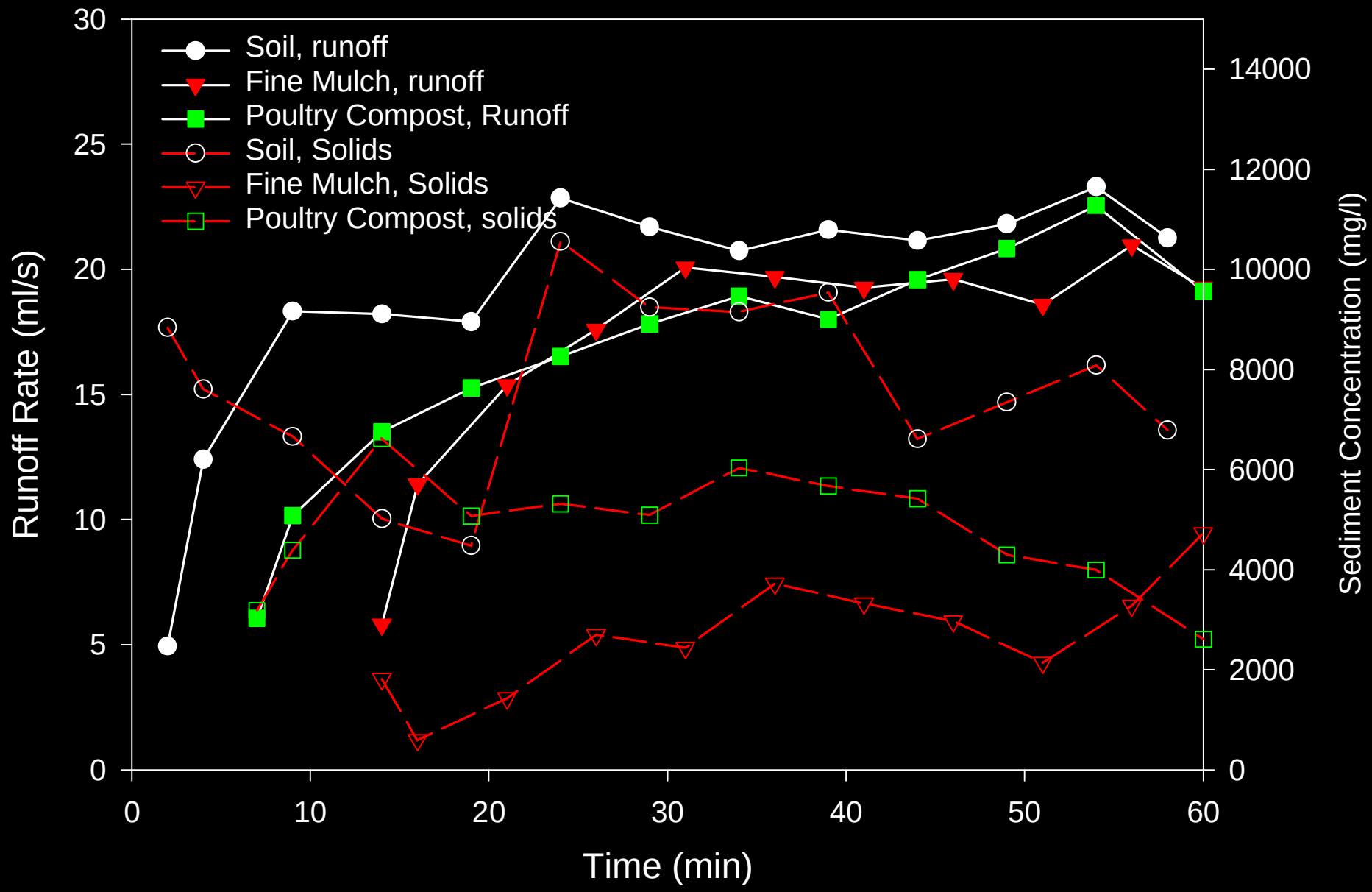
Experimental Setup

- Approx. $1m^2$ pan
- 6 in deep, 2 in soil, 2 in of treatment
- plywood w/ holes, cheesecloth, soil, treatment
- Surface smoothed and leveled
- soil pre-wet before run

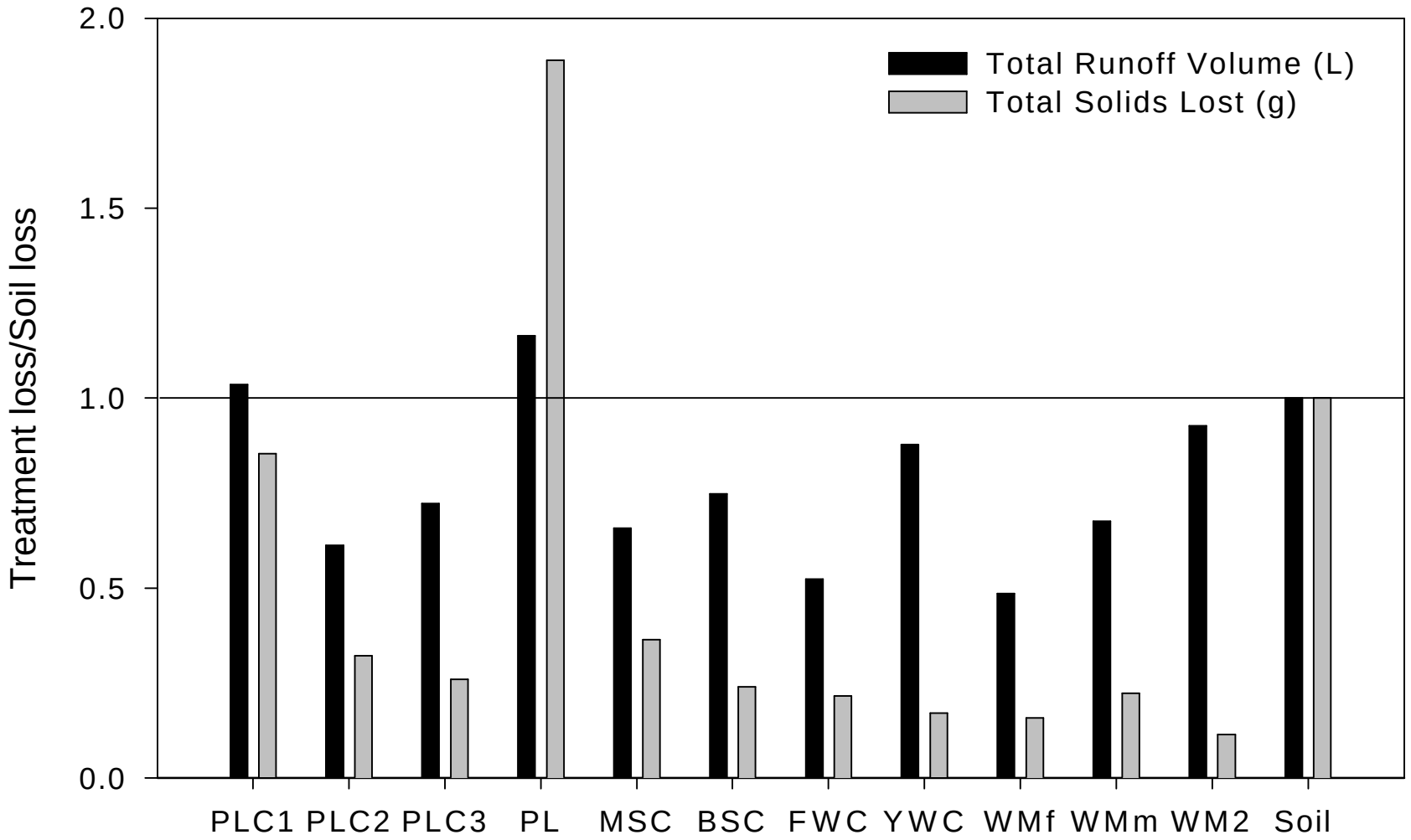
Methods

- Norton Rainfall Simulator
- Approx. 16 cm/hr (Over 6 in/hr)
- Measure RO, SL, nutrients
- Sampling strategy

Results: What happened...



Results:Comparative



Results: Phosphorus

Treatment	*TP ff (mg/l)*	*TP ss (mg/l)*	*TP Load (mg)*	*PO_4 Load (mg)*
WMf	1.12 c	0.22 e	31 b	26 b
WMm	0.96 c	0.38 e	34 b	17 b
Soil	0.96 c	0.45 e	56 b	61 b
YWC	3.78 c	2.57 de	211 b	180 b
FWC	7.24 c	2.16 de	234 b	227 b
MSC	7.78 c	4.62 de	309 b	255 b
WM2	7.20 c	3.42 de	405 b	345 b
PLC3	26.29 c	15.78 de	1197 b	996 b
PLC2	23.94 c	46.94 bc	1800 b	1421 b
BSC	76.89 c	27.73 cd	2928 b	2391 b
PLC1	197.99 b	66.49 b	9969 b	7600 b
PL	439.45 a	263.61 a	33201a	26570 a

Results: Correlation Analysis

- Did not come out as expected… further work ongoing.
- Lower respiration rates- less solids loss
- Need to look at more physical properties.

Independent Variable	*Variable with Significant Correlation (Correlation Coefficient)**
Runoff	None
Total solids loss	Res. (0.86), NO_3-N (0.72)
Ammonia N loss	NO_3-N (0.91), Res. (0.87), SS (0.84), K (0.77), Na (0.77)
Total P loss	NO_3-N (0.90), SS (0.85), K (0.83), Res. (0.81), Na (0.75), P (0.73)
PO_4 loss	NO_3-N (0.90), SS (0.85),), K (0.83), Res. (0.82), Na (0.76), P (0.73)

Phase 2: Pot study

- 9 treatments from previous study
- 5 gal pots over Cecil Soil
- Ryegrass planted in surface
- No irrigation after 2 weeks

Figure 1. Germination Index

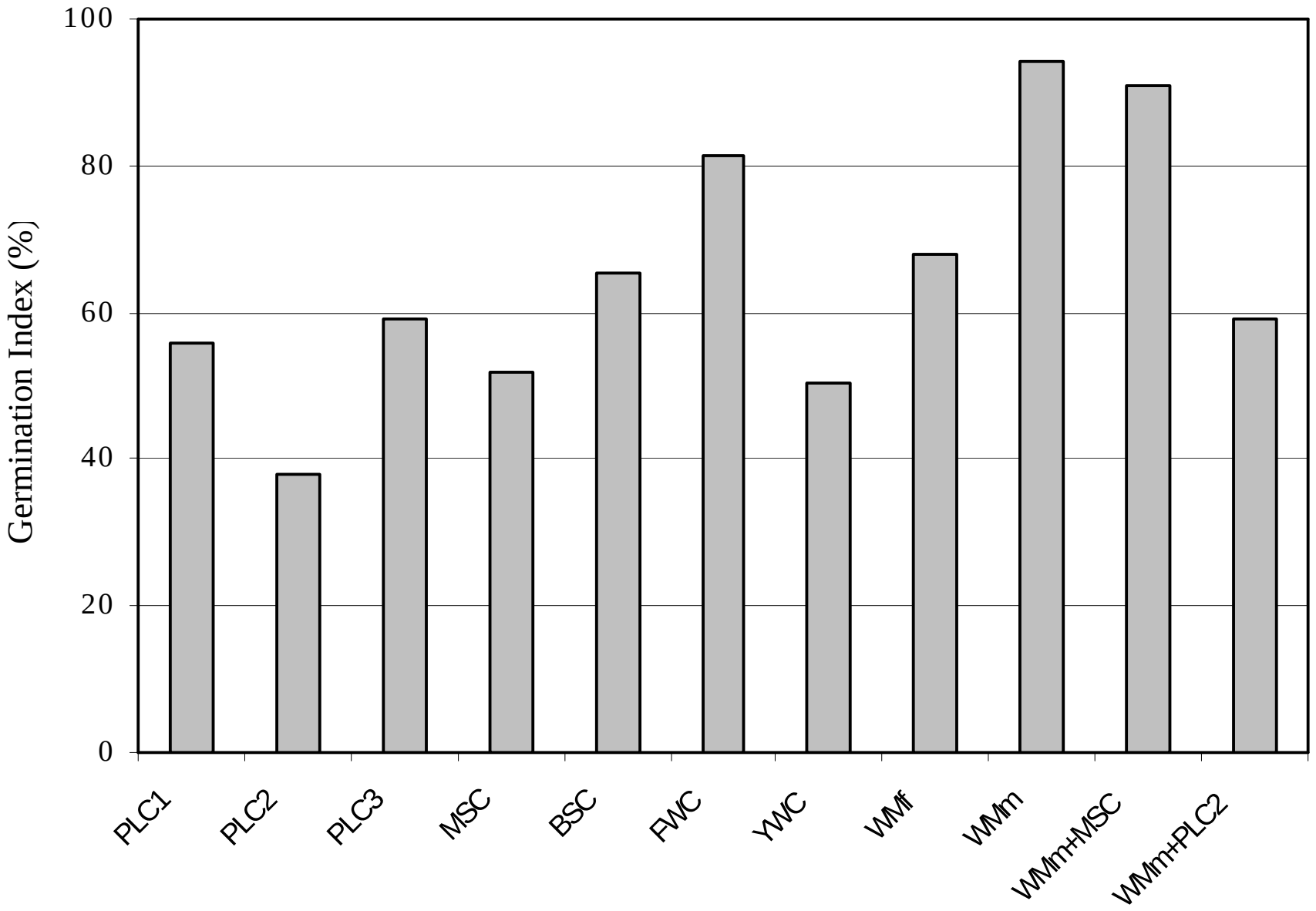
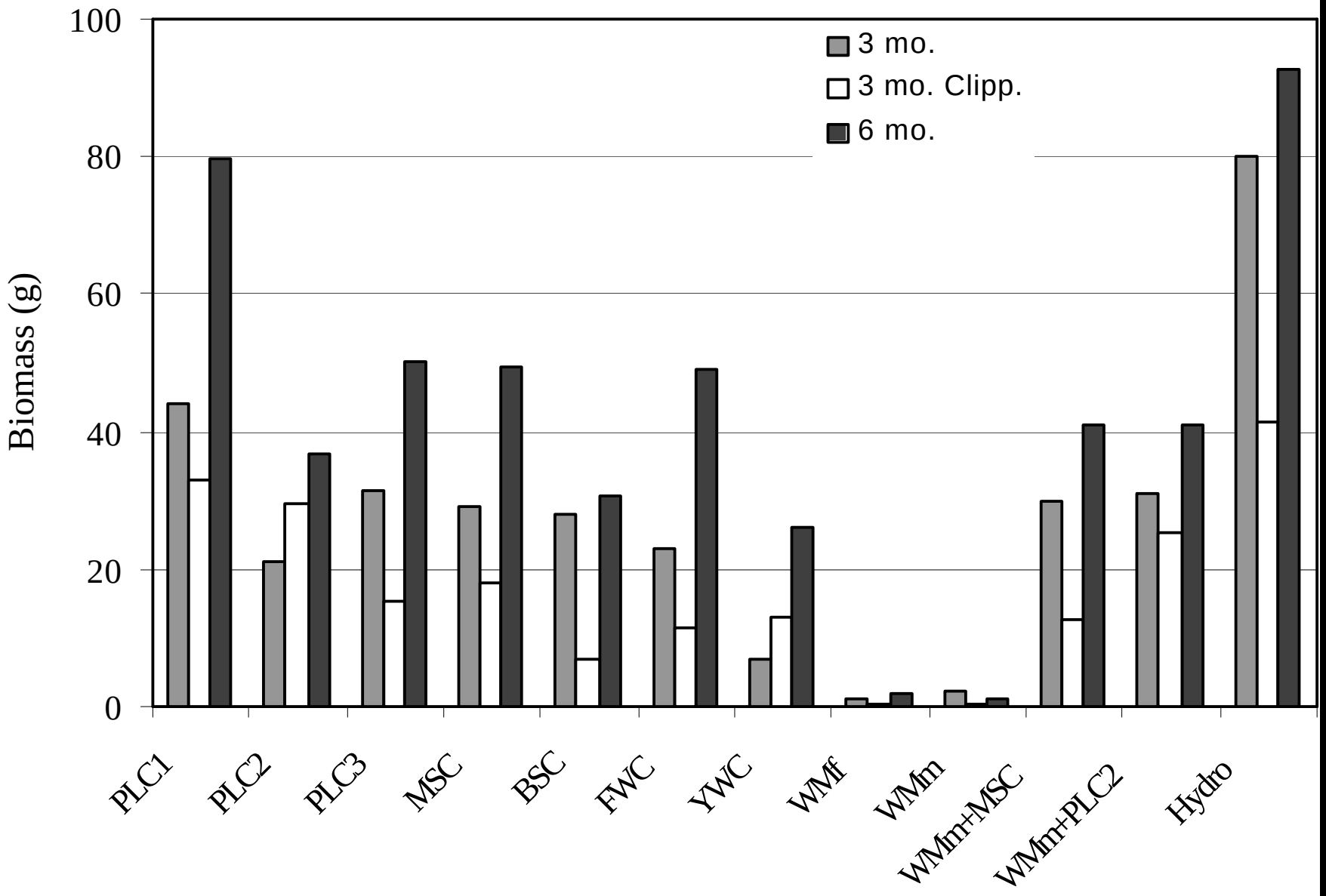


Figure 3. Dry biomass after three and six months.



Phase 3: Field Study

- Conducted on 3’X 15’ plots
- 10% slope
- Treatments applied followed by 1 hour of 4” rain
- Follow-up sampling at 3 months and 1 year.

Treatments in field study

- BS: Bare soil
- HS: Hydroseed w/ silt fence
- HM: Hydroseed w/ mulch berm
- BC: Biosolids w/ biosolids berm
- MS: MSW compost & mulch w/ berm
- PL: Poultry litter compost & mulch w/ berm
- YW: UGA yard waste compost w/ berm

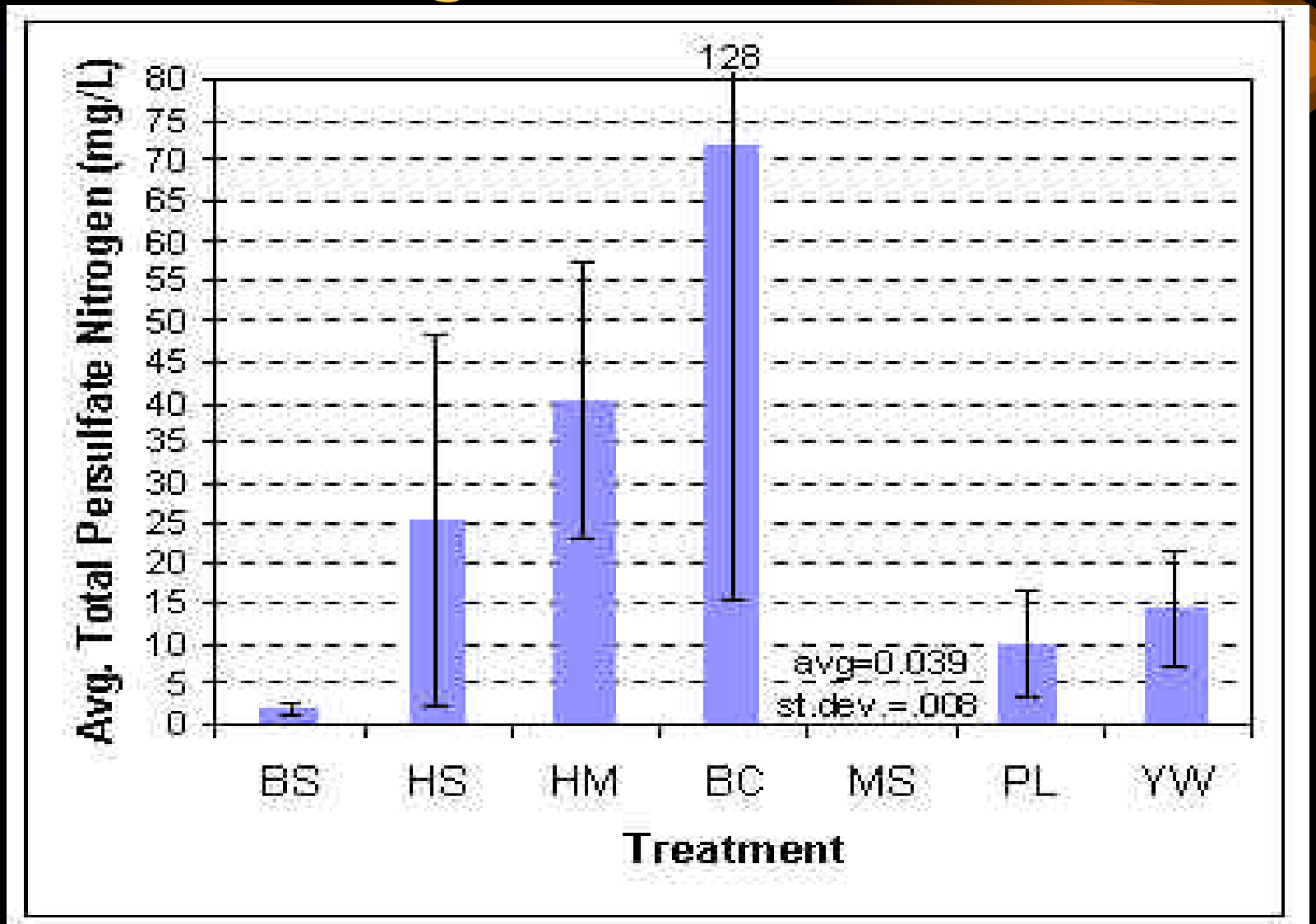
Site

Runoff from Hydroseeded plot

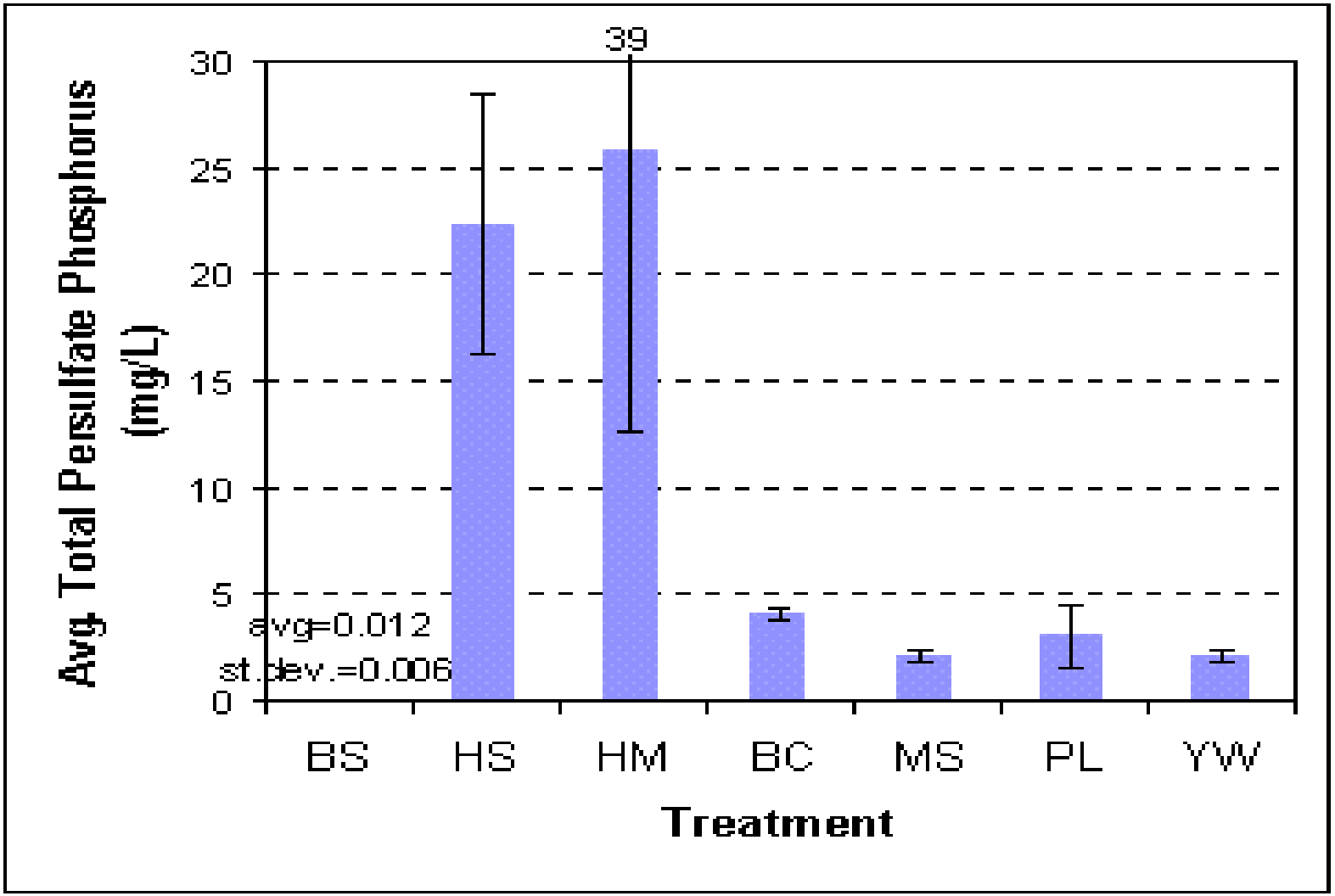
Preliminary Results

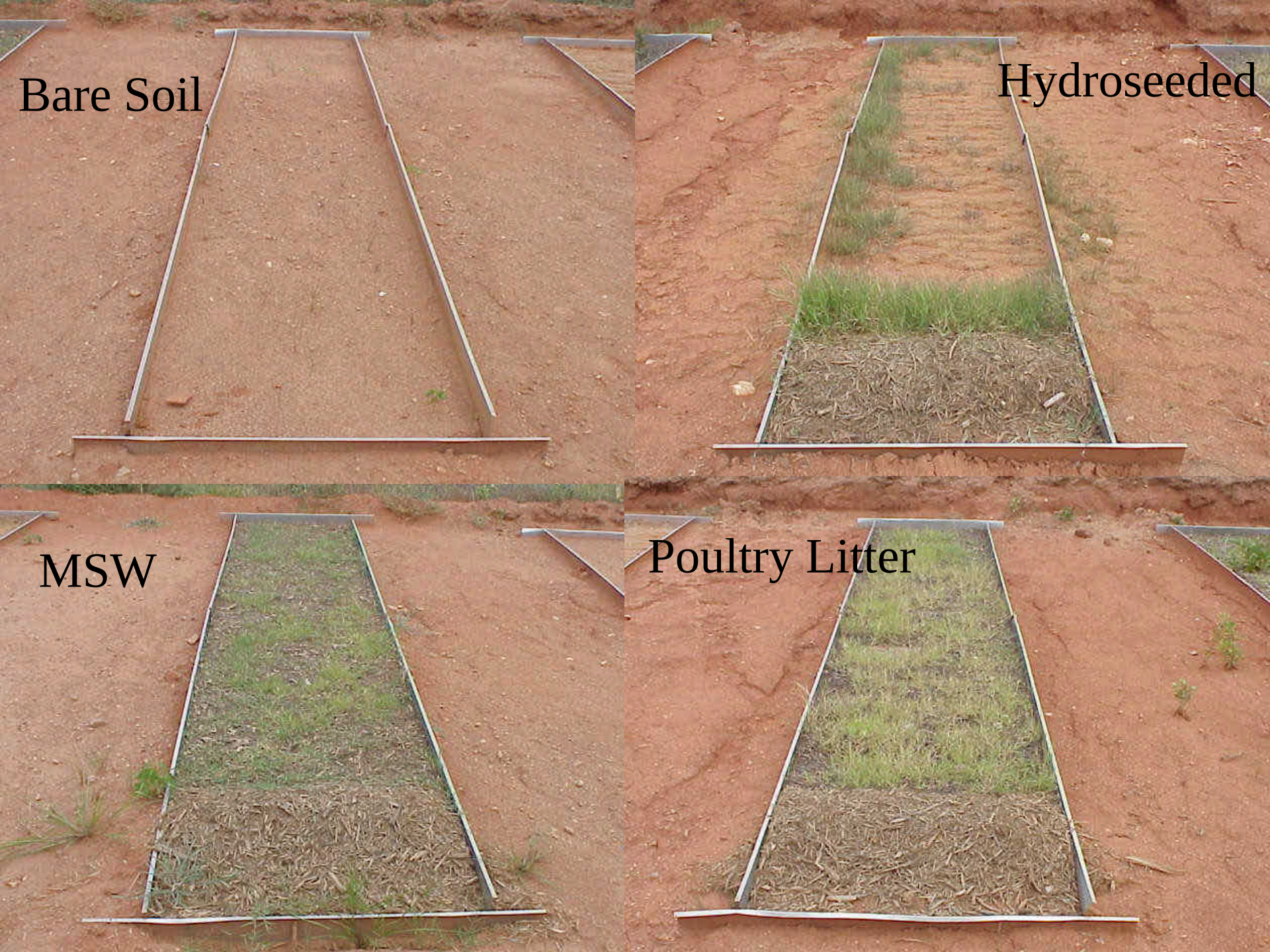
	May-02 TS (g)	Aug-02 TS (g)	May-02 RO (L)	Aug-02 RO (L)	Aug-02 % Cover
1) Bare Soil (control)	28,650	25,146	189	205	17
2) Biosolids compost blanket & compost berm	472	84	170	40	57
3) Poultry litter compost/ mulch blanket & mulch berm	708	98	143	31	64
4) Yardwaste compost blanket & mulch berm	395	61	147	33	62
5) MSW compost/mulch blanket & mulch berm	855	27	101	8	59
6) Hydroseed & silt fence	1,372	810	134	156	22
7) Hydroseed & mulch berm	1,181	348	164	88	22

Nitrogen: Initial Simulation



Phosphorus: Initial Run




Bare Soil
Hydroseeded
MSW
Poultry Litter

Phase III Demonstration Sites:

The University of Georgia

Wood-Tech MULCH

Cobb County Composting Facility

Georgia Composting Association

BOBO GRINDING

P2AD

U.S. Poultry & Egg Association

Animal Waste Management Center

Atlanta Subdivision Trail

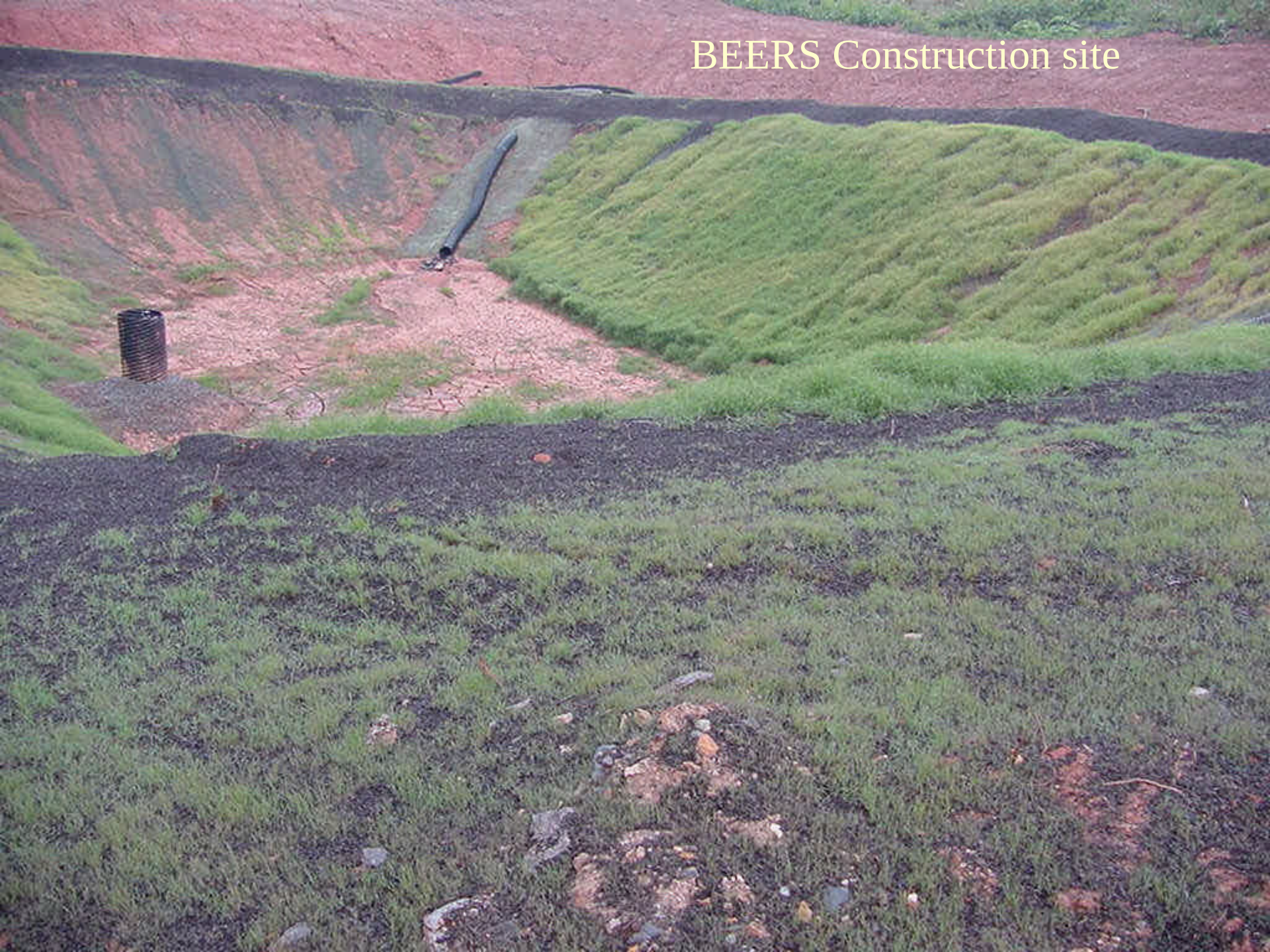

At Application


After 3” Rain Event

Hydroseeded after 3” rain event


Before
GA DOT &
Georgia Natural,
Poultry Gold,
Gromor Organics

Biocycle tour in Atlanta


BEERS Construction site

Not a Cure-all

Rayonier & DOT at 70% slope


Rayonier
Paper
Products &
GA DOT

Questions??