Compost Use for Soil Improvement

Greg Evanylo
Professor and Extension Specialist
Soil Environmental Quality

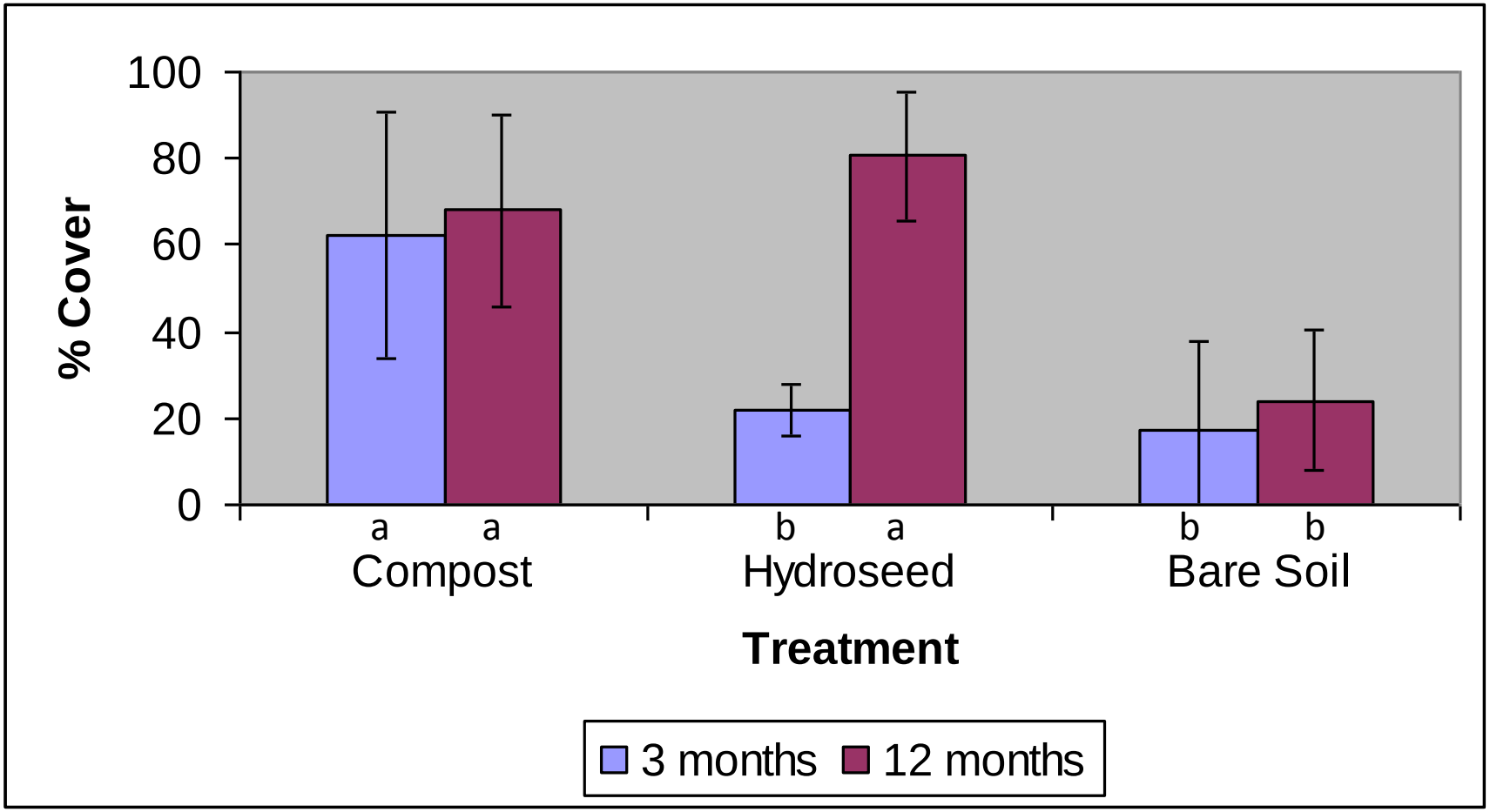
Compost Blankets for Soil Improvement

- Dissipate energy of rainfall impact
- Hold and infiltrate precipitation
- Optimize vegetation establishment and growth

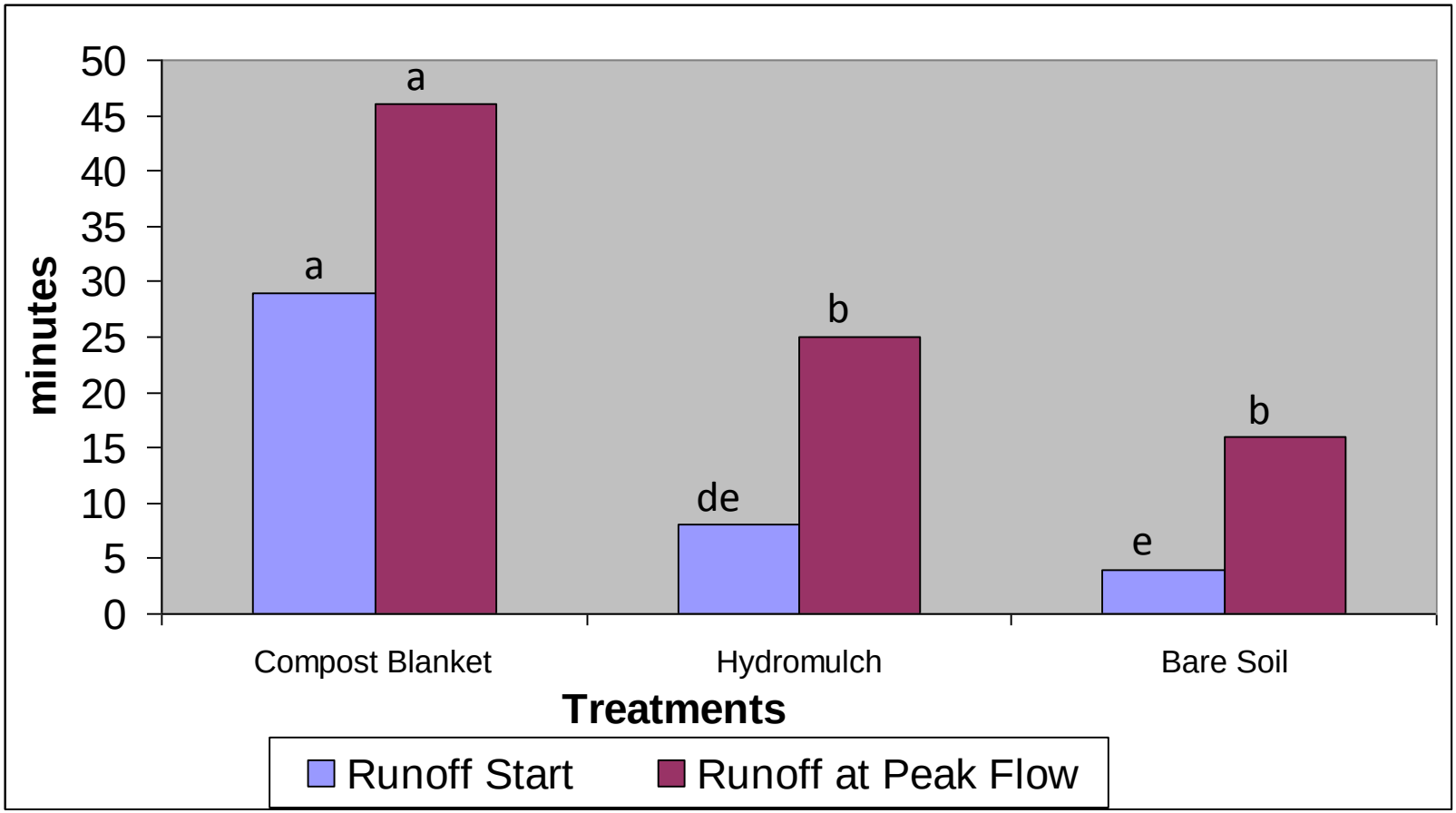
Demo Project in Atlanta after 3” storm event,

Courtesy of Britt Faucette, Filtrexx

Vegetation Cover



Minutes to Runoff Start & Peak Flow (100 yr Storm)



Design Criteria for Compost Blankets

- Universal Soil Loss Equation – USLE
  - http://www.omafra.gov.on.ca/english/engineer/facts/00-001.htm
  - http://www.evsc.virginia.edu/~alm7d/soils/handouts/USLE.pdf
  - RUSLE2: http://www.ars.usda.gov/research/docs.htm?docid=6010
  - Long term avg soil loss, A = R x K x LS x C x P
    - R = rainfall and runoff
    - K = erodibility
    - LS = length-slope
    - C = cropping
    - P = other practices

C Factors

Erosion Control	C Factor	Influencing Factors	Reference
Single net erosion control blanket	**0.15**	33% slope	ECTC, 2004
Straw/Wood Mulch	**0.08-0.16**	10-50% slope; 1.6”/25 hr – 3.2”/1 hr rain; clay loam - silty sand	Demars and Long, 1998; Faucette et al, 2004
Compost Blanket	0.008-0.065	10-50% slope; 1.6”/25 hr – 4”/1 hr rain; clay- silty sand	Mukhtar et al, 2004; Demars and Long, 1998; Demars et al, 2000; Faucette et al 2005, 2006
Forest floor	**0.001**		GA SWCC, 2000

Runoff Coefficients

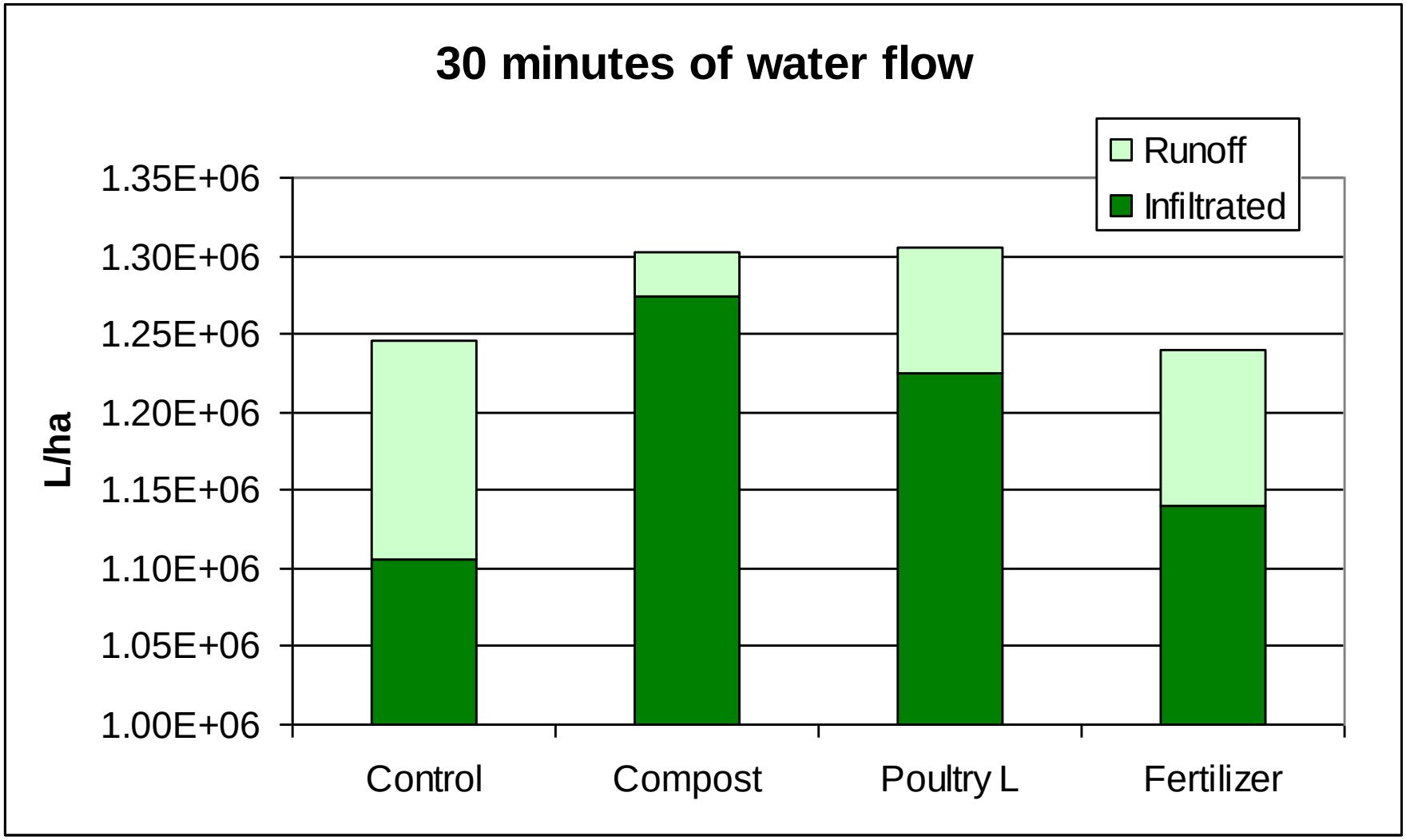
Watershed Surface	Coefficient
Asphalt, concrete, rooftop, downtown area	0.95
Neighborhood, apartment homes	0.7
Single family home site	0.5
Bare graded soil – clay, silt, sand	0.6, 0.5, 0.3
Lawn, pasture	0.1 – 0.35
Undisturbed forest	0.15
Compost blanket	0.1 – 0.32 (0.28)

Reference: GA Storm Water Management Manual, 2001

Compost, Manure and Fertilizer Effects on Soil Properties

- Site: Orange, VA
- Dates: 1999-2005
- Soil: Fauquier silty clay loam (fine, mixed, mesic Ultic Hapludalfs)
- Treatments
  - Compost (5)
  - Poultry litter
  - +/- Fertilizer

Rainfall Simulation and Runoff Collection and Analysis


30 minutes of water flow
Runoff
Infiltrated
L/ha
1.35E+06
1.30E+06
1.25E+06
1.20E+06
1.15E+06
1.10E+06
1.05E+06
1.00E+06
Control
Compost
Poultry L
Fertilizer

Total loads of key water quality attributes in runoff (P<0.05)

Treatment	TSS (kg/ha)	TKN (g/ha)	Total P (g/ha)
Control	107a	310a	218a
Fertilizer	78ab	250a	161ab
Litter	33 bc	149ab	92 b
Compost	15 c	55 b	39 b

Applying & Incorporating Compost

1

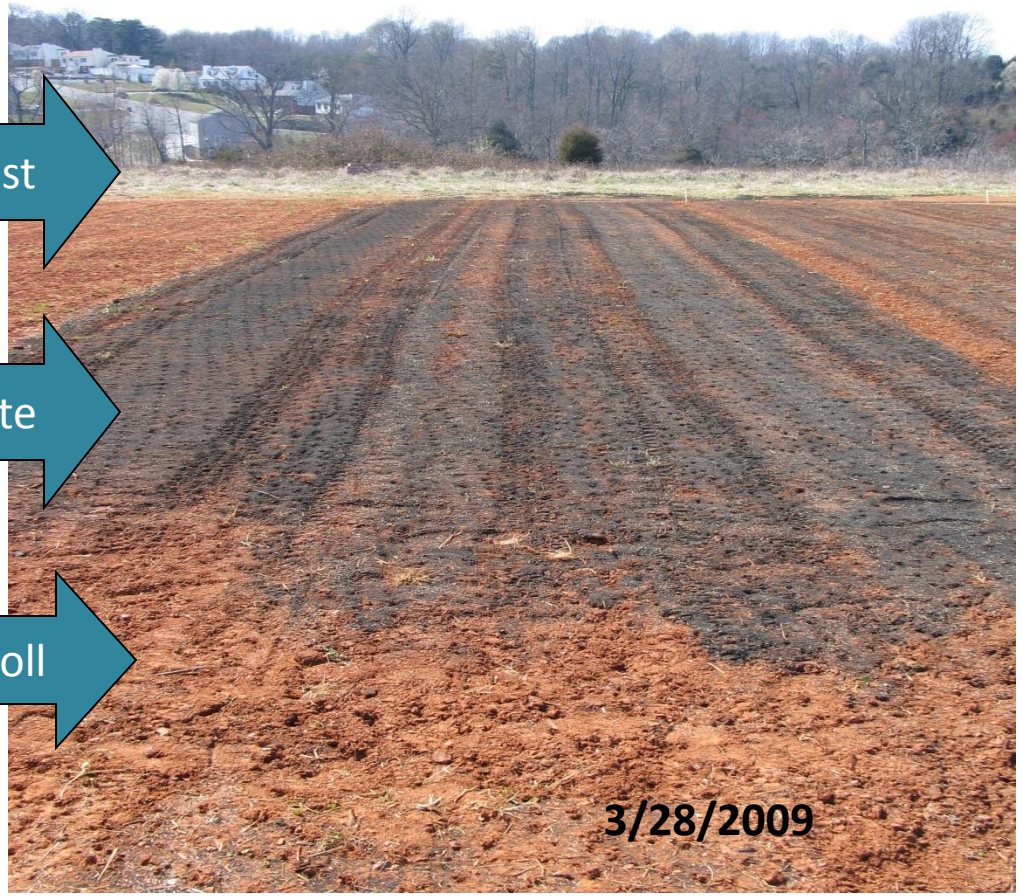
Compost

2

Aerovate

3

Seed, roll



http://connect.ag.vt.edu/compostforturf/

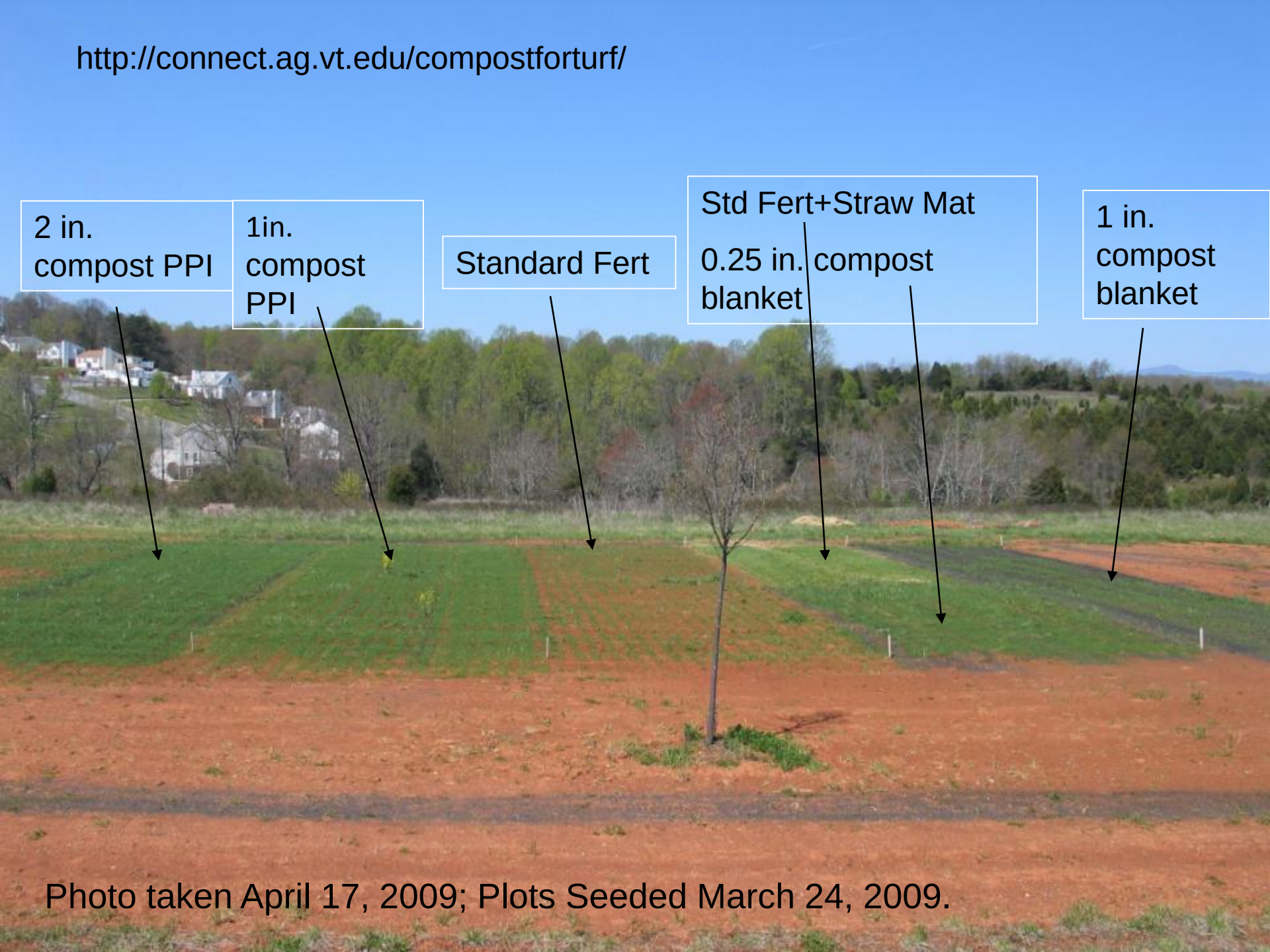


Photo taken April 17, 2009; Plots Seeded March 24, 2009.

Compost Analysis

Property	Value
EC (mmhos cm^{-1})	3.0
pH	7.9
C:N	18:1
Total Organic C (%)	30
Total N (%)	1.7
P (%)	1.0
K (%)	1.4

2 Years after Treatment

Standard fertility treatment based on soil test, rep 3

2” compost, incorporated , Rep 3

Treatment	TOC (%)	BD (g/cc)	M1-P (ppm)
Fertilizer	1.22b	1.25a	16c
1 in compost, PPI	2.82a	1.24ab	22b
2 in compost, PPI	3.20a	1.18b	26a

1” compost, incorporated , Rep 3

July 5, 2011

Compost Effects on Soil Properties

(McConnell et al., BioCycle Apr 1993, p 61-63)

Parameter	Rate (T/Ac)	Effect
Organic matter	18-146	6-163% ↑
Water holding capacity	7-146	5-143% ↑
Cation exchange capacity	57-228	31-94% ↑
Bulk density	20-146	4-71% ↓
pH	20-146	0.8-1.4 ↑

Recommendations

- Compost use should be promoted for improving the physical properties of impervious soils.
- Compost should meet U.S. Composting Council Seal of Testing Assurance standards.
- Compost is typically incorporated into soil on a 20-35% rate by volume, e.g., 1-2 inches compost per 6 inches soil depth.