Welcome to the US EPA's webinar on using compost as a stormwater BMP

March 10, 2009

Agenda

- Information about the call
- A Quick Introduction to Soils and Compost
  - Chris Newman, US EPA Region 5
- Introduction to the USCC STA program
  - Al Rattie, AR Consulting
- Stormwater BMP Standards
  - Britt Faucette, Filtrexx International
- The Composter's Perspective
  - Sharon Barnes, Barnes Nursery
- The Purchaser's Experience
  - Ginny Black, Minnesota Pollution Control Agency

Notice

This presentation has been provided as a part of the U.S. Environmental Protection Agency's series of webinars on using compost as a stormwater best management practice. This document does not constitute EPA policy. Mention of trade names or commercial products does not constitute endorsement or recommendation for use. Links to non EPA web sites do not imply any official EPA endorsement of, or a responsibility for the opinions, ideas, date or products presented at those locations or guarantee the validity of the information provided. Links to non-EPA servers are provided solely as a pointer to information that might be useful to EPA staff and the public.

A few things worth mentioning

- Mute your phone during the call
- Do not place the call on hold
- Send you questions to the moderator via the chat feature; do not ask them during the call.
- This call is being recorded.
- Mute your phone during the call

A few things worth mentioning

- You will be sent a link to a recording of the call in the next few days. It will be good for 30 days.
- We expect the call to last 1 to 1 ½ hours or so. Please feel free to drop off early if you need to.
- Presentations, and other resources, for this call series will be posted at: www.epa.gov/reg5rcra/wptdiv/solidwaste/recycle/compost/webinars.html

Asking Questions During the Call

- The speakers will answer a few selected questions at the end of their presentation
- Pease do not ask questions during the presentation.
- Post questions using the chat box under the participant box on the right side of the screen
- The moderator will then ask the speaker the question.

~~An~~ Quick Introduction to Soils and Compost

Using Compost as a Stormwater Best Management Practice

Chris Newman
EPA Region 5

Introduction to Soils

- Soil quality is key to plant survival
- There are many factors that can effect soil quality. One that we are focusing on today is:
  - Organic matter content (OM)
- Soils can be degraded due to:
  - Erosion
  - Overuse/nutrient depletion
  - Disturbance
- The less degraded the soil, the more productive it can be

Organic Matter Content

- Organic matter (OM) is the fraction of the soil derived from plants, animals, and microorganisms
  - Raw plant residues or microorganisms
  - Active OM
  - Stable OM (humus)
- Functions of OM:
  - Stores nutrients
  - Promotes good soil structure
  - Maintains tilth
  - Minimizes erosion
- 'Ideal' soils contain about 5% organic matter

Organic Matter Content of Soil

- Organic matter content can effect:
  - Cation exchange capacity
  - pH
  - Soil bulk density
  - Water holding capacity
  - Plant diseases/pathogens
  - Susceptibility of soils to erosion
- Building soil OM with compost can help improve these soil characteristics which can lead to improved plant growth

What is Compost?

- Compost is aerobically decomposed organic materials
- Organic materials can be:
  - Yard wastes
  - Food wastes
  - Animal manure/Agricultural wastes
  - Biosolids
- The composting process uses time and temperature to:
  - Degrade the organic materials create a product indistinguishable from the original
  - Kill pathogens and weed seeds
  - Make the OM in the final product more stable than it originally was

What are the Compost BMPs?

- A set of three best management practices that:
  - Help improve water quality
  - Increase water infiltration
  - Reduce erosion
- The compost stormwater BMPs do this with:
  - Berms
  - Blankets
  - Socks

Benefits of Compost in Stormwater BMPs

- Compost retains a large volume of water
  - Prevents or reduces rill erosion
  - Reduces runoff volume
  - Promotes establishment of vegetation
- Compost improves downstream water quality by retaining/adsorbing pollutants
  - Heavy metals, nitrogen, phosphorus, oil and grease, fuels, herbicides, and pesticides
  - Nutrients and pollutants are decomposed by naturally occurring microorganisms

Benefits of Compost in Stormwater BMPs, cont.

- Compost improves soil structure and nutrient content
  - Reduces need for chemical fertilizers, pesticides, and herbicides
- Compost-based BMPs remove as much or more sediment and pollutants from stormwater as traditional perimeter controls, such as silt fence
  - Allow a larger volume of clear water to pass through
- Think of the compost BMPs as another tool
  - They can be used with other stormwater BMPs to meet your project needs.

Compost Quality

- Use sanitized, mature compost with no identifiable feedstock constituents or odors
- Must meet all local, state, and federal quality requirements
- Specifications for EPA's BMPs are at- http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm
  - Enter 'compost' into the search line
- Many states may have compost quality regulations, or regulations that effect the use of compost in this application. Check with them as part of your planning to use these BMPs.

US Composting Council

Seal of Testing Assurance

If it isn't STA compost….*What is it?*

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- ***USCC Seal of Testing Assurance Program***
- Bob Engel, Chairperson USCC Market Development Comm.
- Ron Alexander &

  Al Rattie, STA Program Co-Managers

  215-258-5259

  arconsulting1@verizon.net

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Seal of Testing Assurance Program

The 'STA' program is a:

- compost testing program
- compost labeling program
- information disclosure program

It is NOT a compost standards program, beyond health and safety standards

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PURPOSE…

- To improve customer confidence in compost selection
- To enhance compost's position as a mainstream horticultural, agricultural and retail product
- To provide analytical feedback to compost producers and data to compost users

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GOALS:

- To improve overall customer satisfaction, as well as ‘field’ results
- To improve compost purchasing decisions
- To promote customer-oriented composters
- Move industry towards standardized test methods

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GOALS, cont.…

- To improve and facilitate the procurement of compost products

The STA program gives a standardized analytical report to the purchaser of compost. They can easily compare products and chose the right product to meet their needs. They will know all material submissions have had the same analytical or test method performed giving apple to apple results.

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KEY PROGRAM ELEMENTS:

- Participants will regularly sample and test their product using standardized protocols
  - Testing frequency is based on the tonnage of compost produced
    - 1-6250 tons — 1 per quarter
    - 6251-17500 tons — 1 per 2 months
    - 17501 tons and above — 1 per month

    NEW small composter category – less than 2500 tons/year

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KEY PROGRAM ELEMENTS, cont'd:

- Participants must follow Program Rules and Logo Use Agreement criteria
- Annual participation fee
- Compost products are certified, not the composting facilities (feedstock, not physical manipulation dependant)

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KEY PROGRAM ELEMENTS, cont'd:

- Compost testing will be performed at STA Program approved labs
- Approved labs are required to use test method protocols from the TMECC manual and participate in the Compost Analysis Proficiency Program (managed by Bob Miller, Ph.D. of Colorado State University)

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KEY PROGRAM ELEMENTS, cont'd:

- Specific compost information will be disclosed to customers (and the USCC) using a uniform label (Compost Technical Data Sheet - CTDS)
  - Compost test analysis results
  - List of compost ingredients
  - End use instructions

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KEY PROGRAM ELEMENTS, cont'd:

- Participants will test for various parameters
  - pH, soluble salts, nutrients (N,P,K,Ca,Mg), moisture, organic matter, maturity (bioassay), stability (respirometry), particle size, pathogens & trace metals
  - All products will be required to meet 503 pathogen and trace metal requirements, as well as any state requirements

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US COMPOSTING COUNCIL

Seal of Testing Assurance

Barnes – Regional Composting
3511 West Cleveland Ave.
Huron, OH 44839
Telephone: 800-421-8722
Fax: 419-433-3555

Sample Date: 8/14/02

COMPOST TECHNICAL DATA SHEET

Compost Parameters	*Reported as (units of measure)*	*Test Results*	*Test Results*
Plant Nutrients:	%, weight basis	*% wet weight basis*	*% dry weight basis*
Nitrogen	Total N (TN or TKN+NO_3-N)	.72	1.12
Phosphorus	P_2O_5	.13	.21
Potassium	K_2O	.32	.50
Calcium	Ca	2.34	3.64
Magnesium	Mg	.57	.89
Moisture Content	%, wet weight basis	42	
Organic Matter Content	%, dry weight basis	31.31	
pH	unitless	7.4	
Soluble Salts *(electrical conductivity)*	dS/m (mmhos/cm)	3.49	
Particle Size	screen size passing through	½"	
Stability Indicator *(respirometry)* CO_2 Evolution	mg CO_2-C/g TS/day, AND	.14	
	mg CO_2-C/g OM/day	.5	
Maturity Indicator *(bioassay)* Percent Emergence, AND Relative Seedling Vigor	average % of control, AND	92	
	average % of control	86	
Select Pathogens	PASS/FAIL: per US EPA Class A standard, 40 CFR § 503.32(a)	Pass	
Trace Metals	PASS/FAIL: per US EPA Class A standard, 40 CFR § 503.13, Tables 1 and 3.	Pass	

Participants in the US Composting Council's Seal of Testing Assurance Program have shown the commitment to test their compost products on a prescribed basis and provide this data, along with compost end use instructions, as a means to better serve the needs of their compost customers.

Directions for Product Use:

New Lawns: Apply a 1-2" layer to soil and incorporate to a depth of 5-7", apply seed, then rake and water.

Flower Beds: Apply a 1-2" layer to soil and incorporate to a 6-8" depth. Condition soil this way every year to 2 years. Plant flowers and water.

Trees & Shrubs: Dig a hole 2/3 the depth of the root ball and at least twice as wide. Mix 1 part compost with 2 parts soil obtained from the planting hole. Place the tree or shrub in the planting hole and apply amended soil around the root ball. Firm soil occasionally and water.

Topsoil Manufacturing/Upgrading: Mix 1 part compost with 2 parts existing or purchased soil and blend uniformly.

Growing Mixes: Planter box or raised bed mixes can be produced by mixing 1 part compost to 1 part pine bark and 1 part soil, sand or expanded shale. Potting mixes should contain 1 part compost, 1 part peat moss or pine bark, and 1 part perlite, vermiculite, styrofoam, or other aggregate.

Mulching: Spread a 2-3" layer around trees, shrubs, and flowers. Always avoid placing mulches against plant trucks and stems.

Garden Beds *(food crops)*: Apply a 1-2" layer to soil and till to a 6-8" depth. Reapply each year, or as per soil test recommendations.

NOTE: The USCC does not assess whether or not, or to what extent, these directions are sound, sufficient or otherwise appropriate. It is the participant's responsibility alone to ensure that they are.

Compost Ingredients:

Yard trimming, food by-products

This compost product has been sampled and tested as required by the Seal of Testing Assurance Program of the United States Composting Council (USCC), using certain methods from the "Test Methods for the Examination of Compost and Composting" manual. Test results are available upon request by calling Barnes Nursery at 800-421-8722. The USCC makes no warranties regarding this product or its contents, quality, or suitability for any particular use.

For additional information pertaining to compost use, the specific compost parameters tested for within the Seal of Testing Assurance Program, or the program in general, log on to the US Composting Council's TMECC web-site at http://www.tmecc.org.

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Promoting the proper use of compost products

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Promoting…..

…the appropriate product for a specific use

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Seal of Testing Assurance Program

METHODS:

STA Participants will:

- Complete on-going product testing (QC Program)
- Disclose test data results (lab analyses)
- Provide appropriate end use instructions

Treat compost like any other retail, horticultural or agricultural product marketed in the US!

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Seal of Testing Assurance Program - *FAQ*

Do you have to be a member of USCC to be in STA?

NO – The Program is open to ALL compost producers

What does it cost to belong?

$500/year USCC members OR $650/year non-USCC members for first product (50% for each additional product

Do I have to be active with time commitment to the STA Program?

NO – Your only requirement is to test your compost pursuant to the Rules Agreement and disclose this information

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STA Program 'Stats' – 12/31/08

- Companies in the STA Program = 129
- Compost Products in the STA Program = 161
- Compost volume in the STA Program =
  Approx. 2,938,600 tons, or
  Approx. 5,877,200 cubic yards
- States with STA participants = 31
- Labs in STA Program = 11

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STA participant companies by state

- **TX*/27** **CA*/23** OR/13 **WA*/12**
- NC/6 IL & VA/5 each IA/4
- GA,MN,MO,OH/3 each
- CO,CT,HI,WI/2 each

*States with DOT requiring STA compost ONLY

1 each in FL, ID, KT, MA, MD, MI, MT, NV, NY, OK, PA, SC, UT, VT, WY

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2008 STA Activities

- Exhibited at 2008 national ASLA conference
- Created 2 PowerPoint presentations for STA participant use (LA and DOT)
- Created STA compost use literature
- Published articles in national media
- LA Spec. CD revised & updated
- Ongoing state DOT and LA outreach
- Designed and purchased trade show banner
- Designed and purchased trade show booth

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NEW STA Exhibit – Available to Program participants

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STA – *Look for the logo!*

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Seal of Testing Assurance

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Compost Used for Storm Water Management

Britt Faucette, Ph.D., CPESC, LEED AP
Filtrexx International

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
H	pH units	5.0 – 8.5	N/A
oluble salt oncentration (electrical onductivity)	dS/m (mmhos/cm)	Maximum 5	Maximum 5
loisture content	%, wet weight basis	30 – 60	30 – 60
rganic matter content	%, dry weight basis	25 – 65	25 – 100
article 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)
tability arbon dioxide evolution te	mg CO_2–C per g organic matter per day	<8	N/A
hysical contaminants manmade inerts)	%, dry weight basis	<1	<1

Compost Filter Sock Specifications

Parameters	Units of Measure	Vegetated Filter Sock	Unvegetated Filter Sock
H	pH units	5.0 – 8.5	6 – 8
oluble salt concentration lectrical conductivity)	dS/m (mmhos/cm)	Maximum 5	Not applicable
oisture content	%, wet weight basis	30 – 60	30 – 60
rganic matter content	%, dry weight basis	25 – 65	25 – 65
article 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
ability arbon dioxide evolution rate	mg CO_2-C per gram of organic matter per day	<8	<8
hysical contaminants (manmade inerts)	%, 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

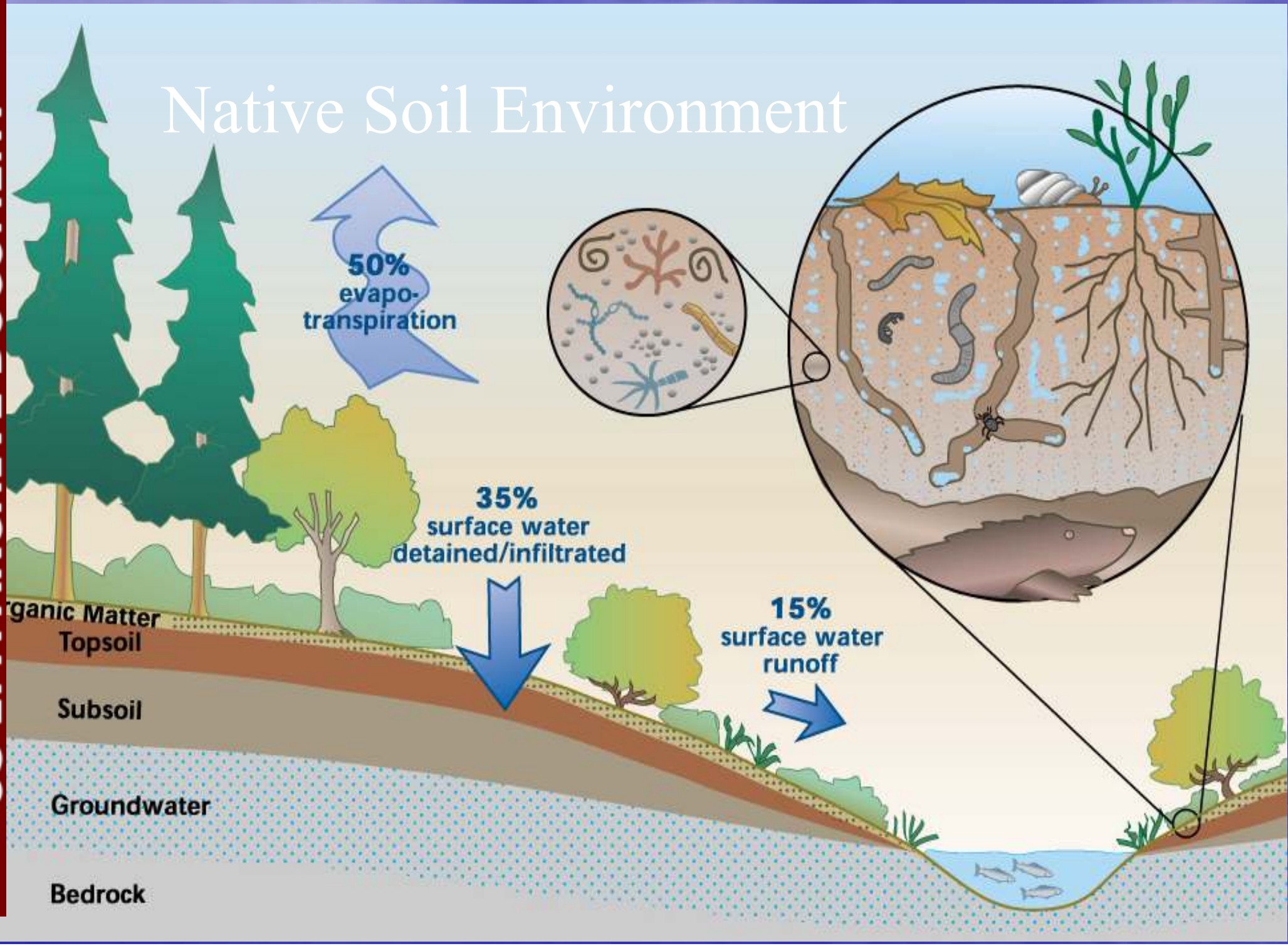
Filter Sock/Berm:

Designed for Optimum Filtration & Hydraulic-flow

Compost Blanket:

Designed for Optimum Water Absorption & Plant Growth

Native Soil Environment



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)

The University of Georgia

Average from 4 in Storm Event

Note: Straw w/ PAM is
GA DOT standard practice

2000
1500
1000
500
0

- 35 x

- 4.5 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

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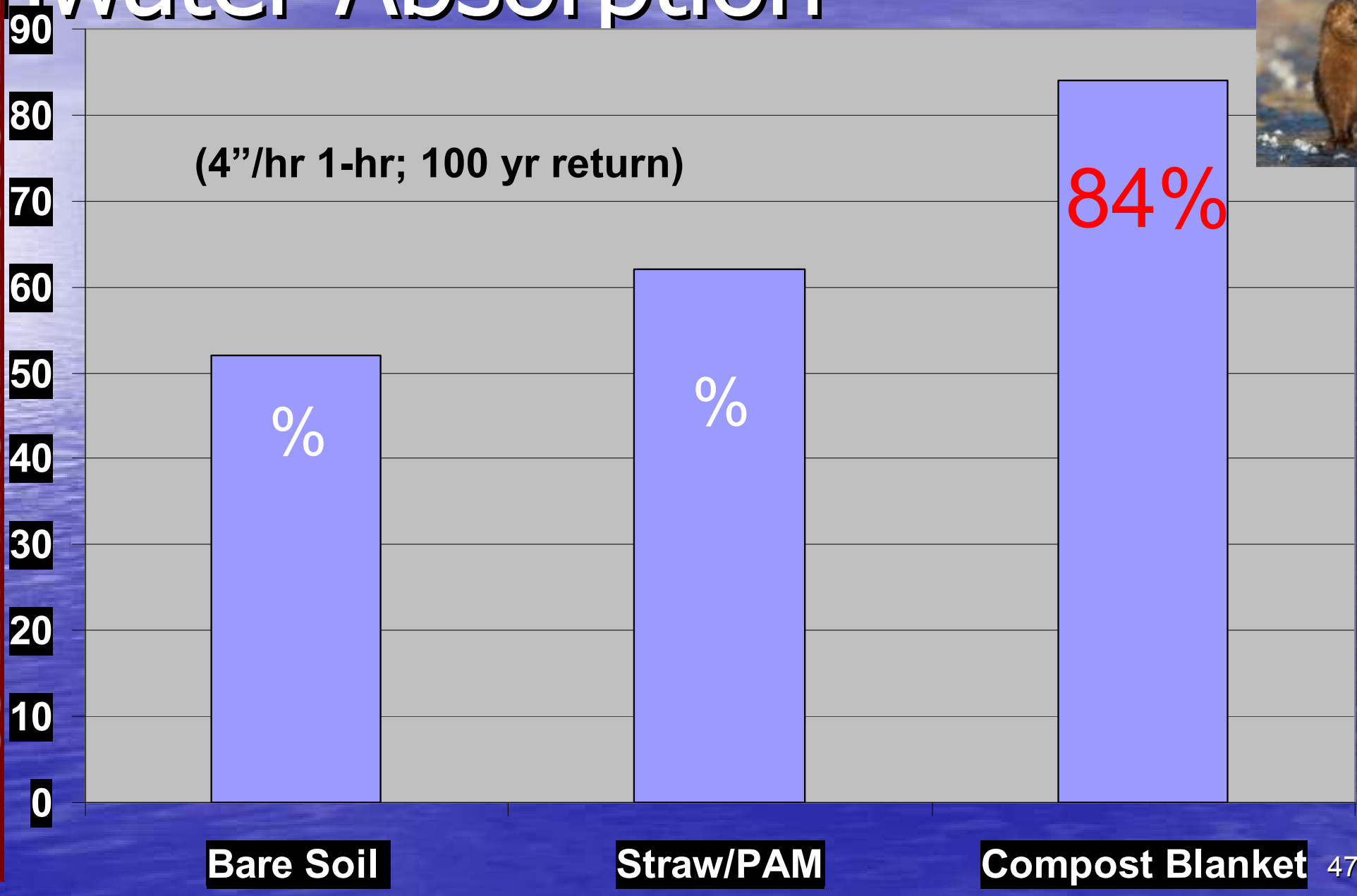
nwater Absorption



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 rain	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

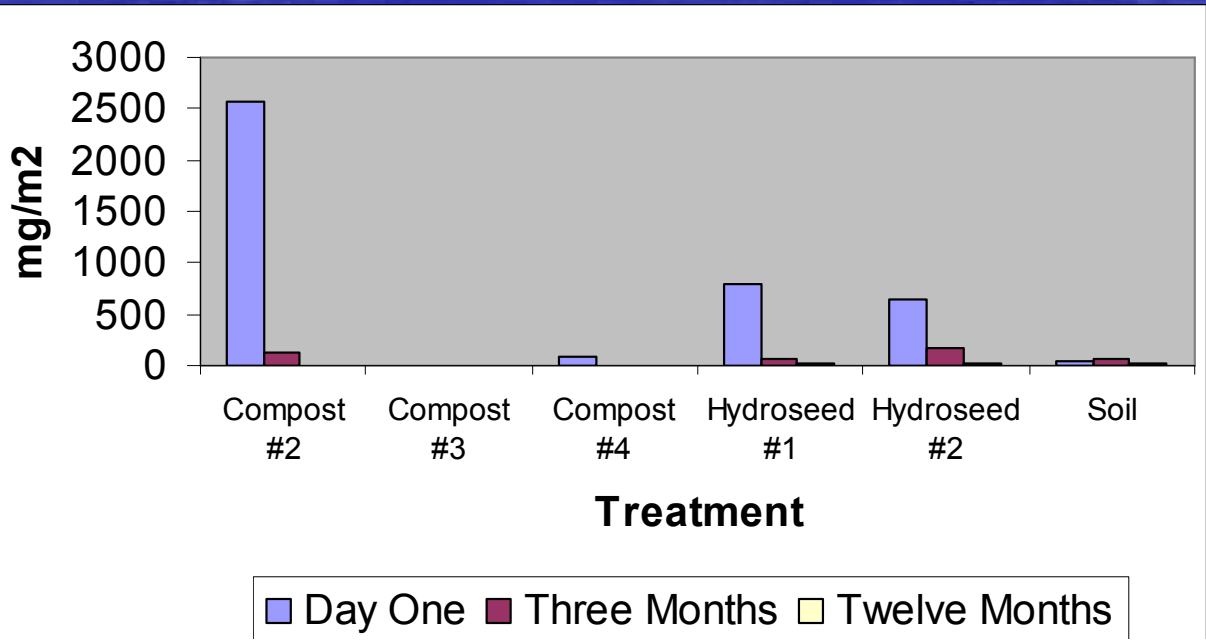
Pollutant Load Reduction:
Compost Blanket vs Conventional Seeding

	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:

Designed for Optimum Filtration & Hydraulic-flow

Compost Blanket:

Designed for Optimum Water Absorption & Plant Growth

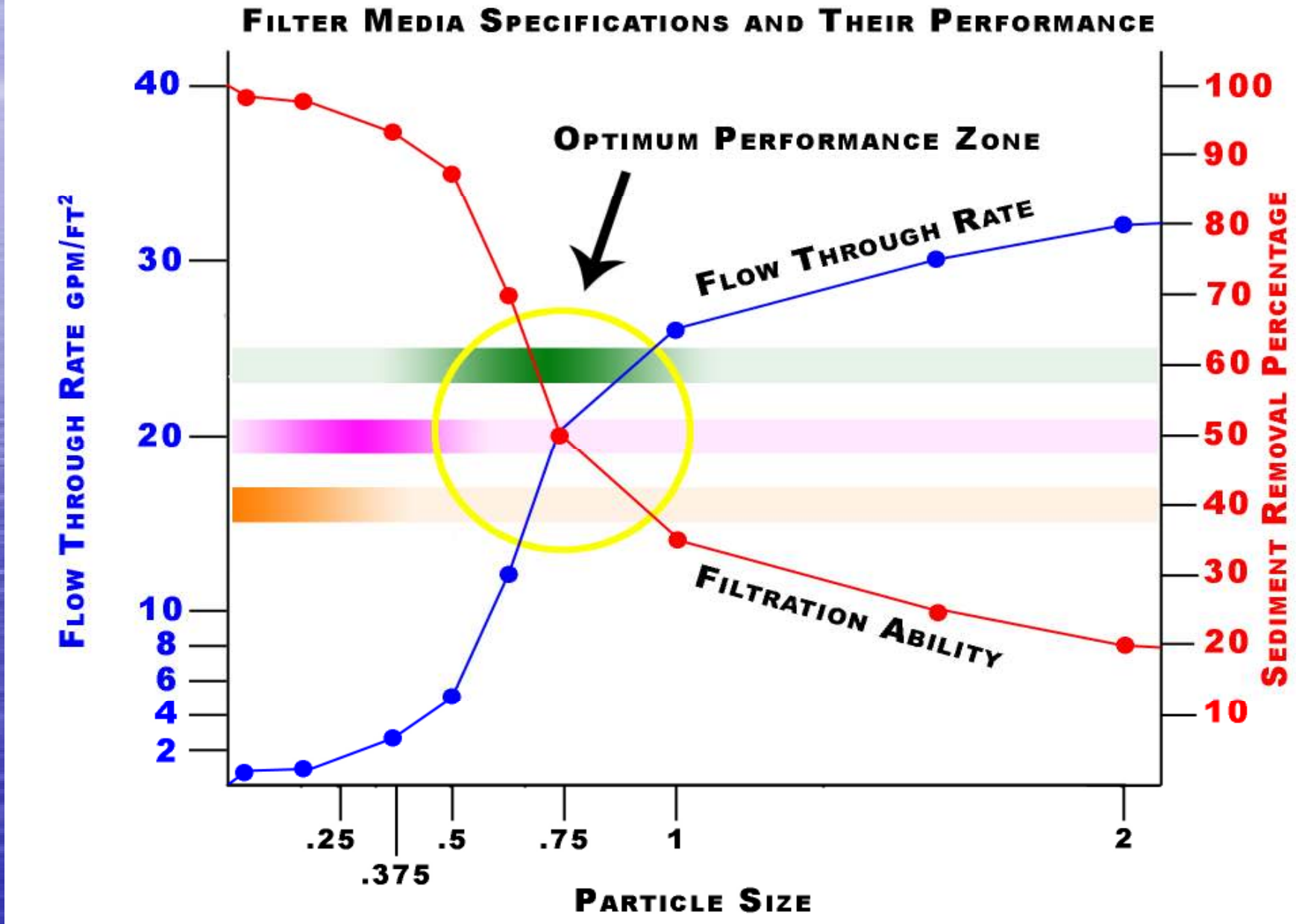
Filtration Devices use Filter Media







Does Particle Size Matter?



USDA ARS

Sediment Summary

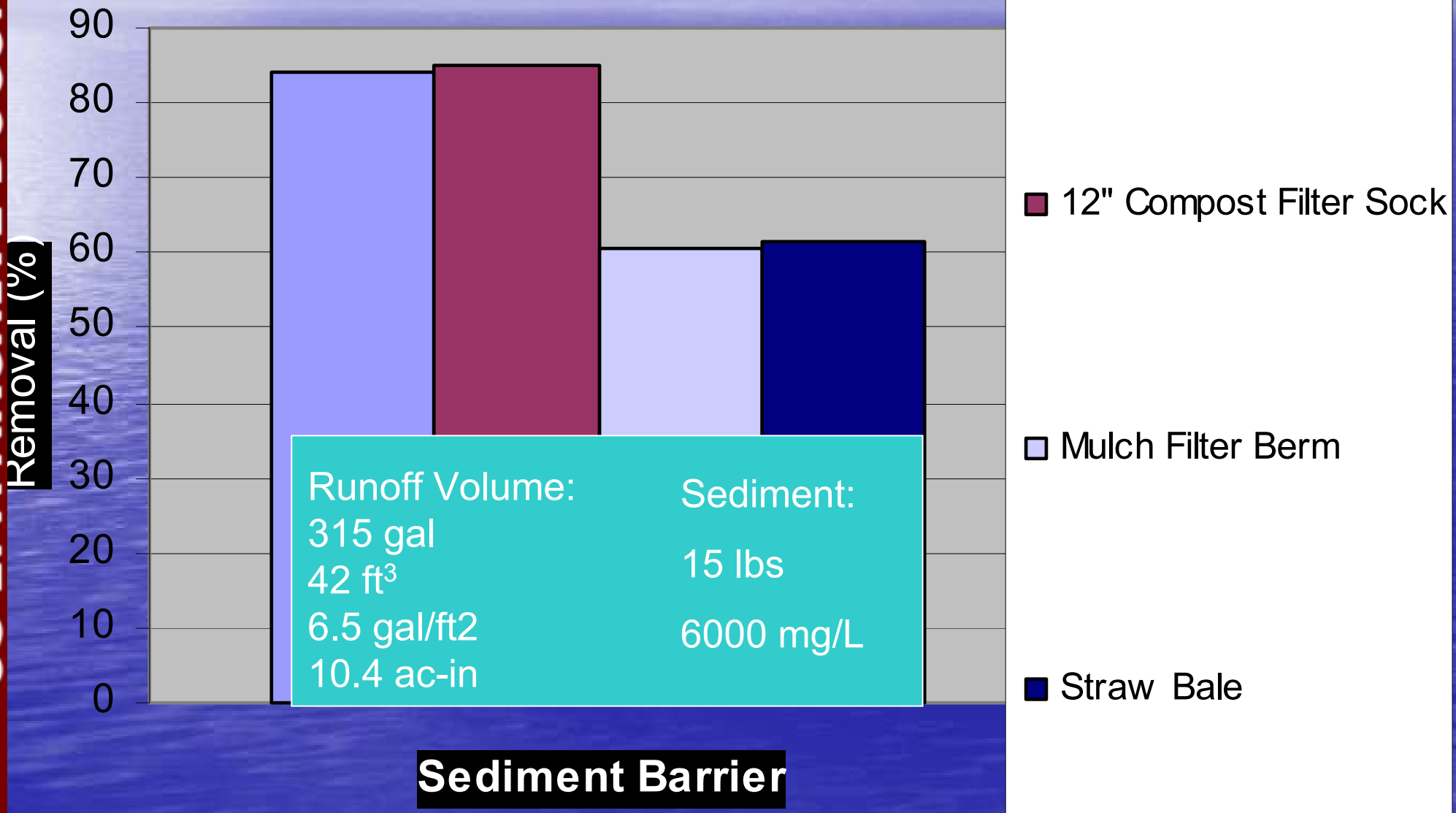
% Reduction of TSS & Turbidity

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.

e University of Georgia

TSS Removal for Sediment Control Barriers



	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 Fenc	•260 gal •1.7 g/ft^2 •2.75 ac-in	•850 lbs •150 lbs/ft^2 •125 t/a	72%
Straw Wattl	•260 gal •1.7 g/ft^2 •2.75 ac-in	•850 lbs •150 lbs/ft^2 •125 t/a	59%

Sandy loam soil

ASTM 6459 for RECPs

USDA ARS

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
lter ock	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

Britt Faucette, Ph.D., CPESC, LEED AP

Director of Research/Technical Services

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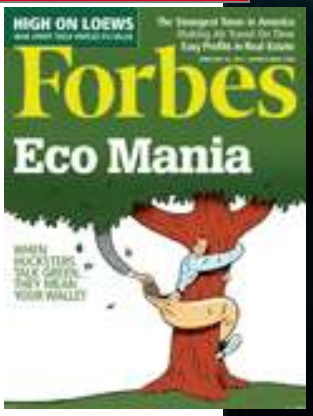
Producing New Soil Products for Emerging Stormwater BMP Markets

Sharon Barnes
Barnes Nursery, Inc.
EPA Region 5 Webinar
March 10, 2009

The Soil Blender: Where the Rubber Meets the Road



Composting-Soil Blending Facility

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"Prescription" Soils/Media for Managing Stormwater

- **Rain Gardens**
- **Bio-Retention Swales**
- **Roof Top Media**
- **Compost Blankets**
- **Compost Socks**
- **Compost Berms**

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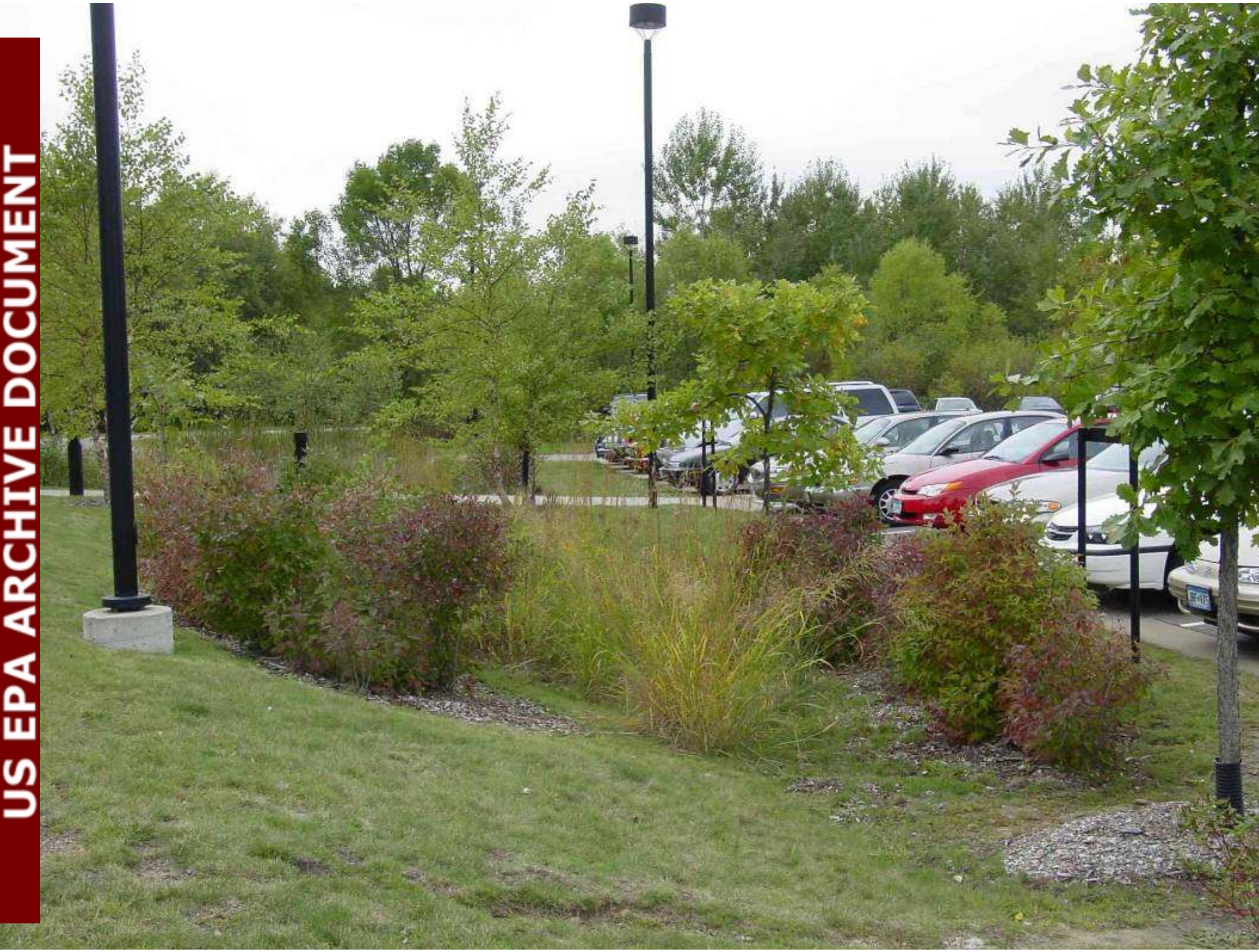

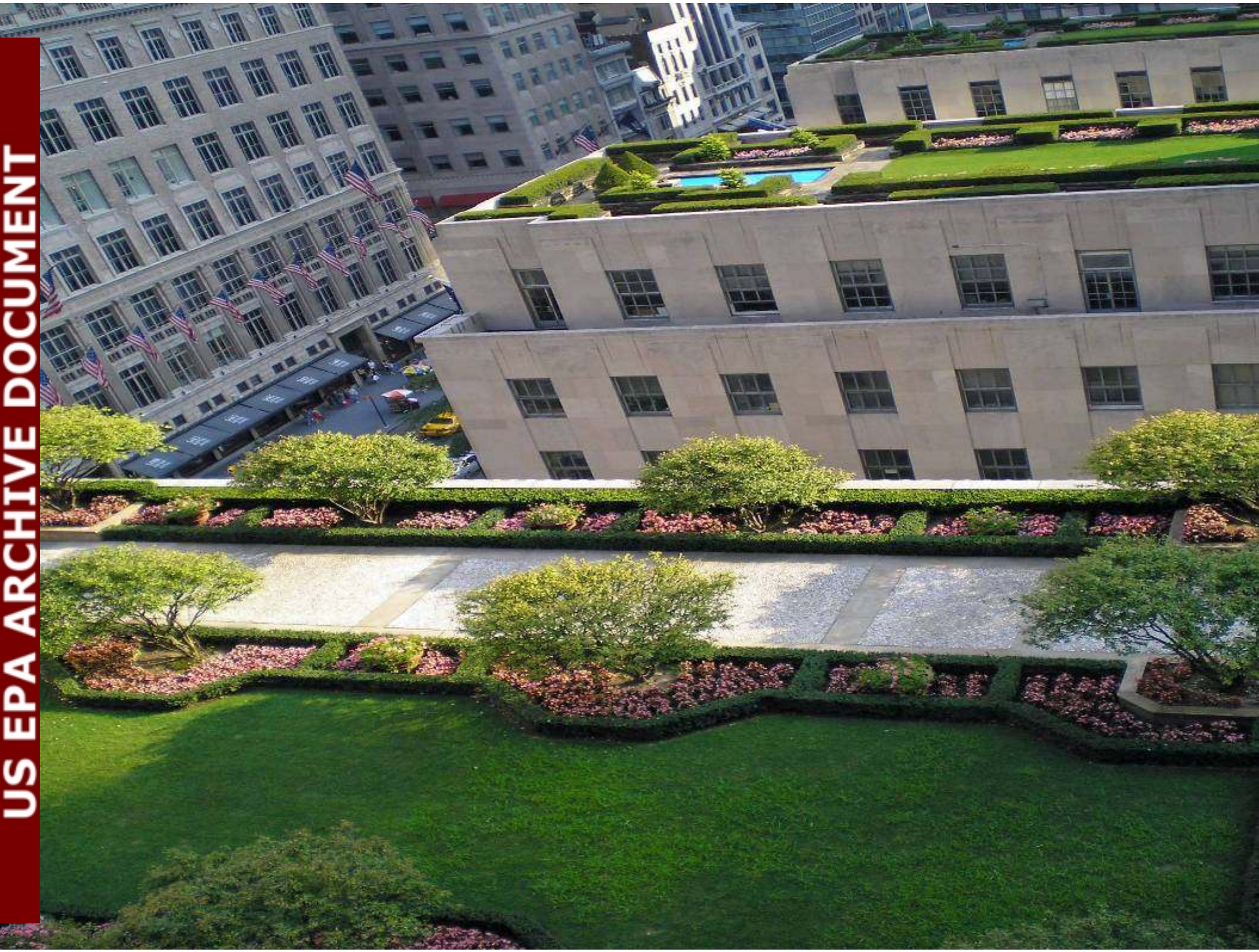

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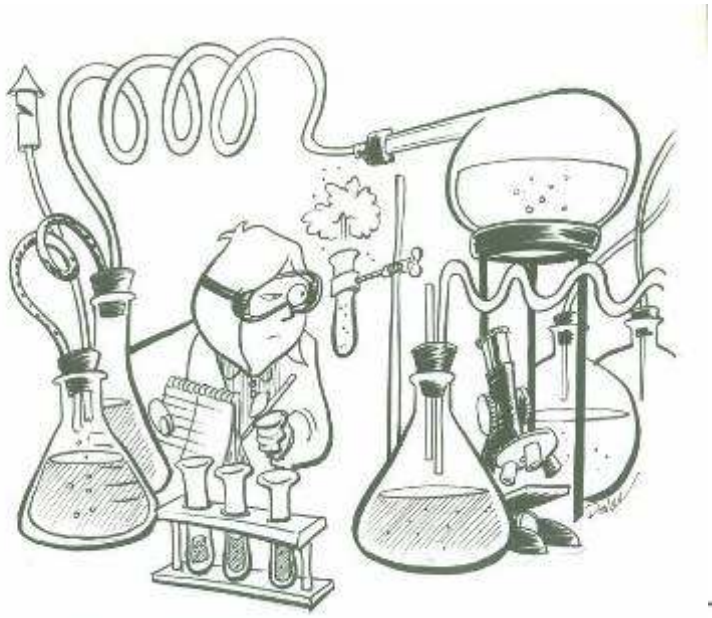
About Mix Specifications

- **understand the material components and what they do**
- **know any percolation rate required**
- **overall project succ on:**
  - **good design**
  - **proper media**
  - **skillful installation**



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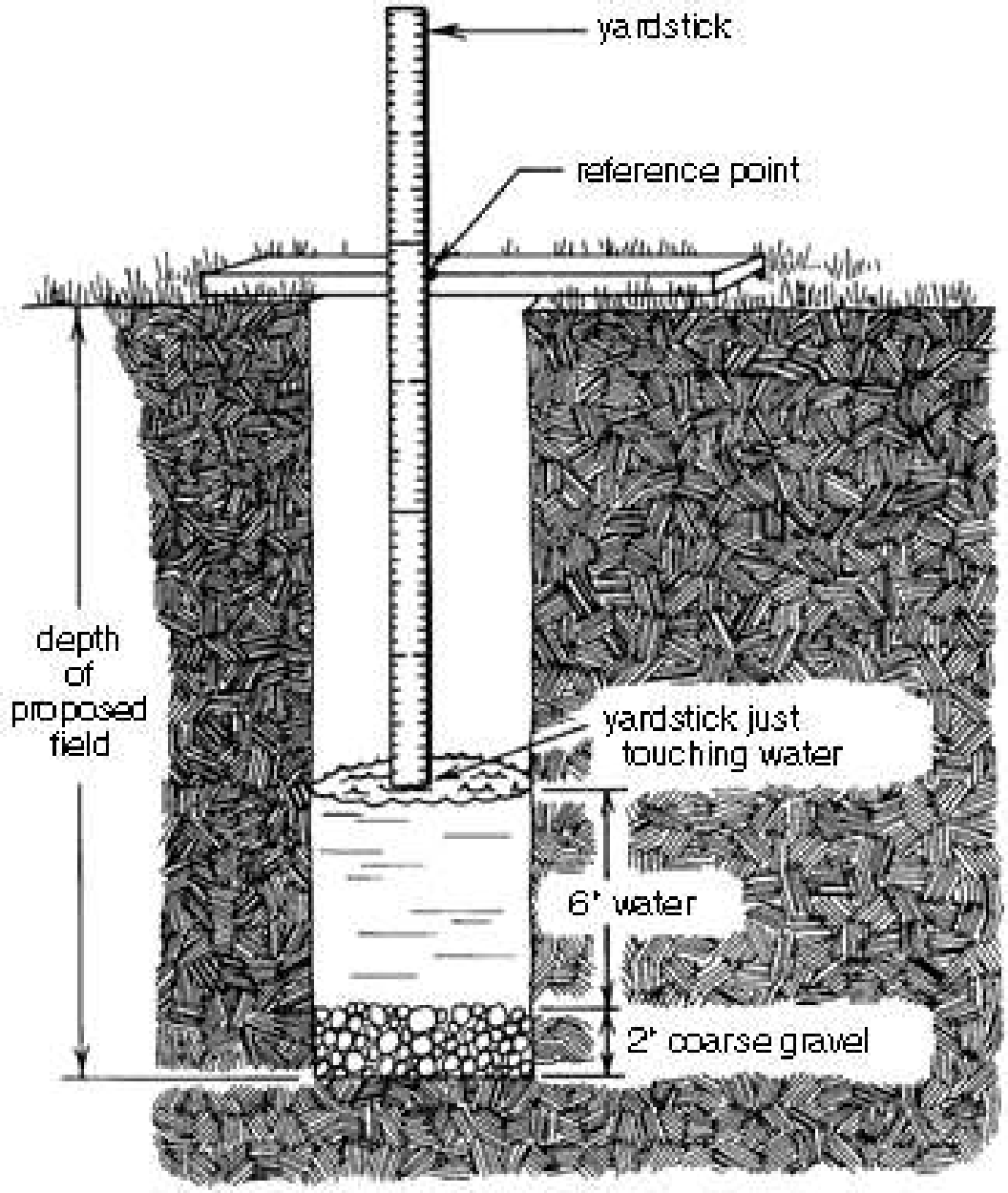

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Media ingredients often include:

- Topsoil
- Sandy or Clay Loam
- Sand
- Silt
- Compost
  - Leaf
  - Biosolids
  - msw
- Hardwood Bark
- Pine Bark Fines
- Perlite/vermiculite
- C6 Aggregate
- Light Weight Aggregates:
  - Solite
  - Stalite
  - Haydite

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Source Materials "Locally Produced"

Cotton Burr Story

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Volume Specifications

–Soil……20-40%

–Bark/leaf humus compost/peat……20-30%

–Sand……30-

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Final Specifications Range

- Sand content……..50-85%
- Silt content ……0-50%
- Clay content……<5-20%
- OM

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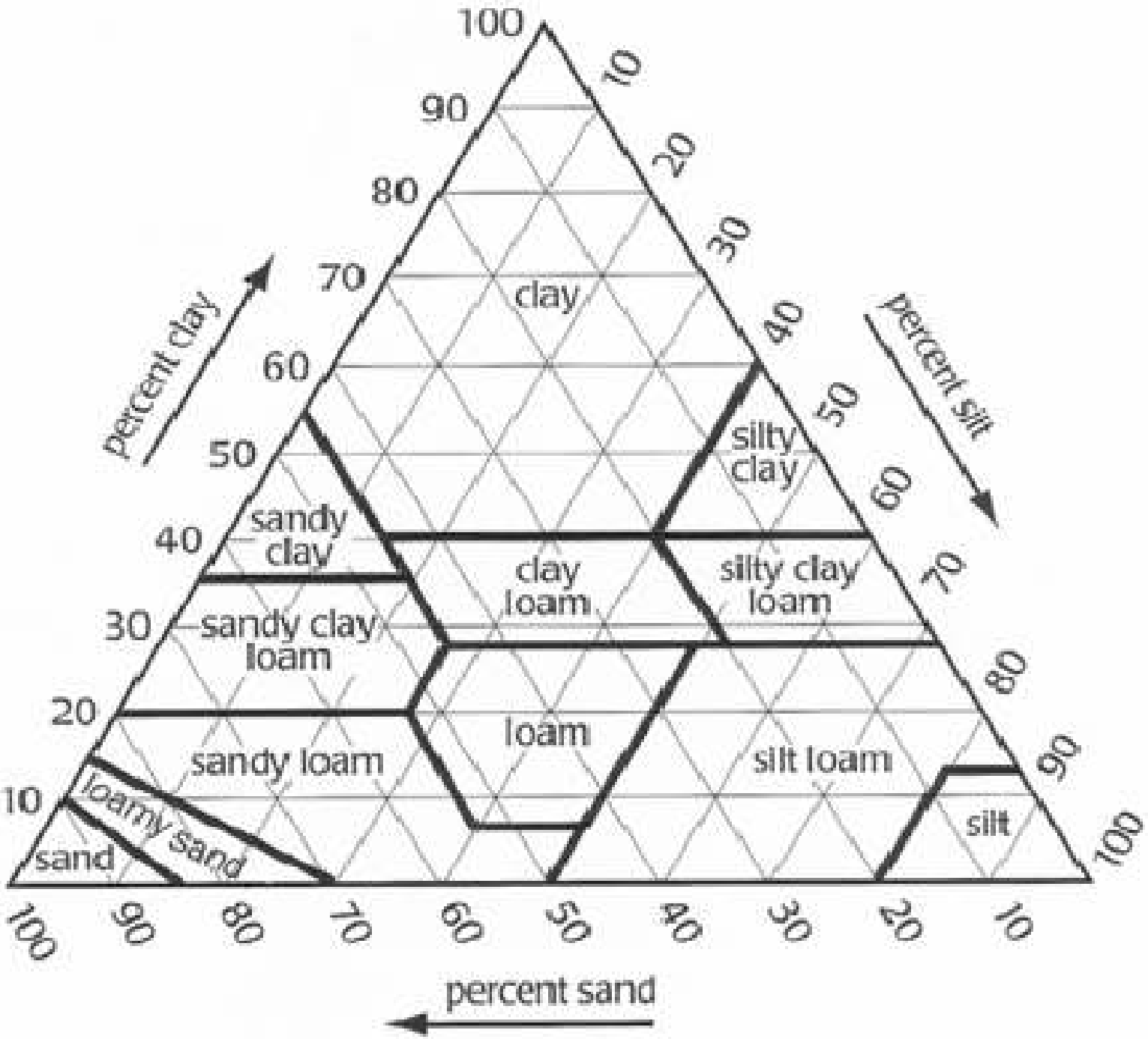
Textural Triangle



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USDA Sand Particle Classification

Soil Separate	Diameter Limits/mm
• Clay……	<0.002
…	0.002-0.05
• Silt……	0.05-0.10
...	0.10-0.25
• Very fine sand…….	0.25-0.50
• Fine sand…….	0.50-1.00
• Medium	1.00-2.00

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Other Notable Specifications

- AASHTO: American Association of State Highway and Transportation Officials
  - Soil and Soil Aggregate Classification System

- ASTM: American Society for Testing and Materials
  - Establish test methods
  - Establish classifications

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Meeting the Specifications

- Send samples of all components to soil lab:
  - Soil & Sand:
    - Textural Analysis
    - Organic Matter Content
    - pH
  - Compost:
    - STA testing
    - Textural Analysis
  - Light Weight Aggregate, etc.
- Send media specifications to soil lab
- Ask soil lab to formulate “recipe” to meet specifications based on the test results

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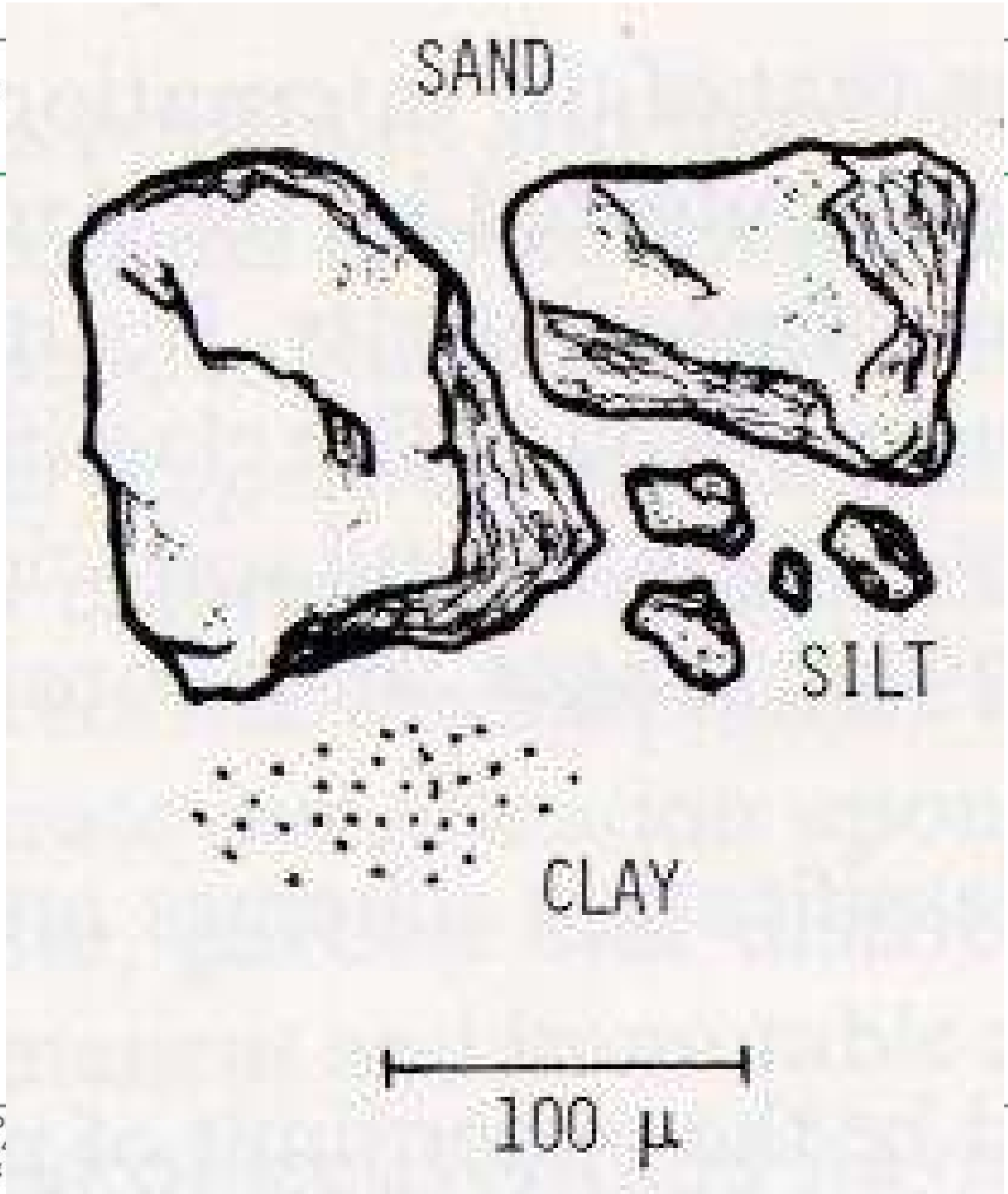

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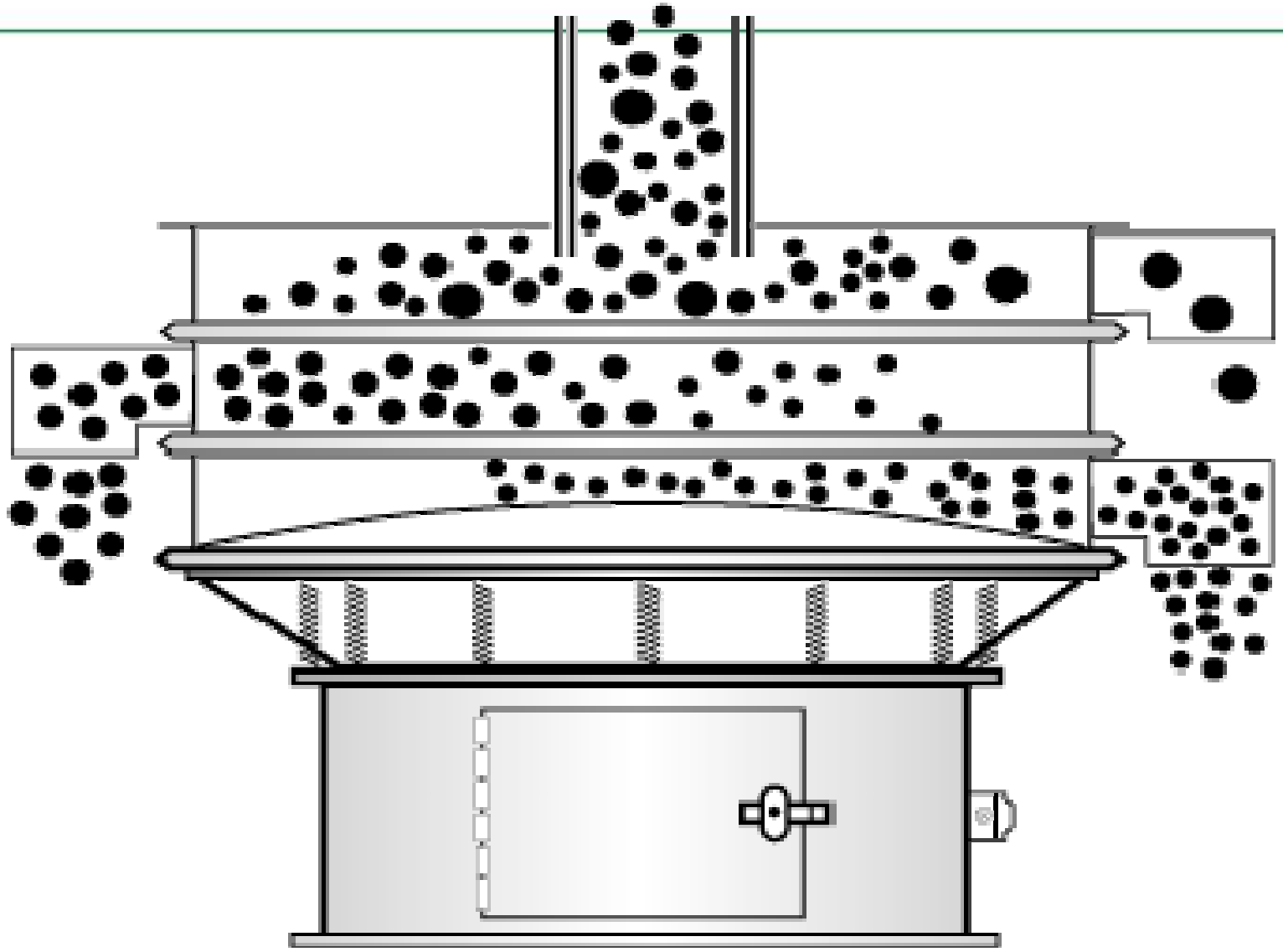

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SUBMITTED BY:
BARNES NURSERY
3511 W. CLEVELAND RD.
HURON, OH 44839

ACCOUNT NO.: T1256

SUBMITTED FOR:

REPORT DATE: MARCH 6, 2009
REPORT REF.: 92.084

SOIL TEXTURAL ANALYSIS REPORT

LAB. NO.	SAMPLE IDENTIFICATION	MECHANICAL ANALYSIS % SAND	% SILT	% CLAY	U.S.D.A. TEXTURE CLASS
878420	#1 TOPSOIL	57	21	22	SANDY CLAY LOAM

Method Used: Conforms to ASTM D 422-63

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SUBMITTED BY:
BARNES NURSERY
3511 W. CLEVELAND RD.
HURON, OH 44839

ACCOUNT NO.: T1256

SUBMITTED FOR:

REPORT DATE: MARCH 6, 2008
REPORT REF.: 92.084PHOM

REPORT OF ANALYSIS

LAB. NO.: 878420
SAMPLE ID: #1 TOPSOIL

TEST PARAMETER	RESULT	UNITS
Organic Matter	7.4	%

METHOD: Organic matter reported as Loss on Ignition at 440°C on oven dry (105°C) soil according to ASTM D2974-87 Method C.

LAB. NO.: 878420
SAMPLE ID: #1 TOPSOIL

TEST PARAMETER	RESULT	UNITS
Soil pH	7.6	SU

METHOD: Soil pH determined on a 1:1 soil/deionized water slurry according to NCR-221.

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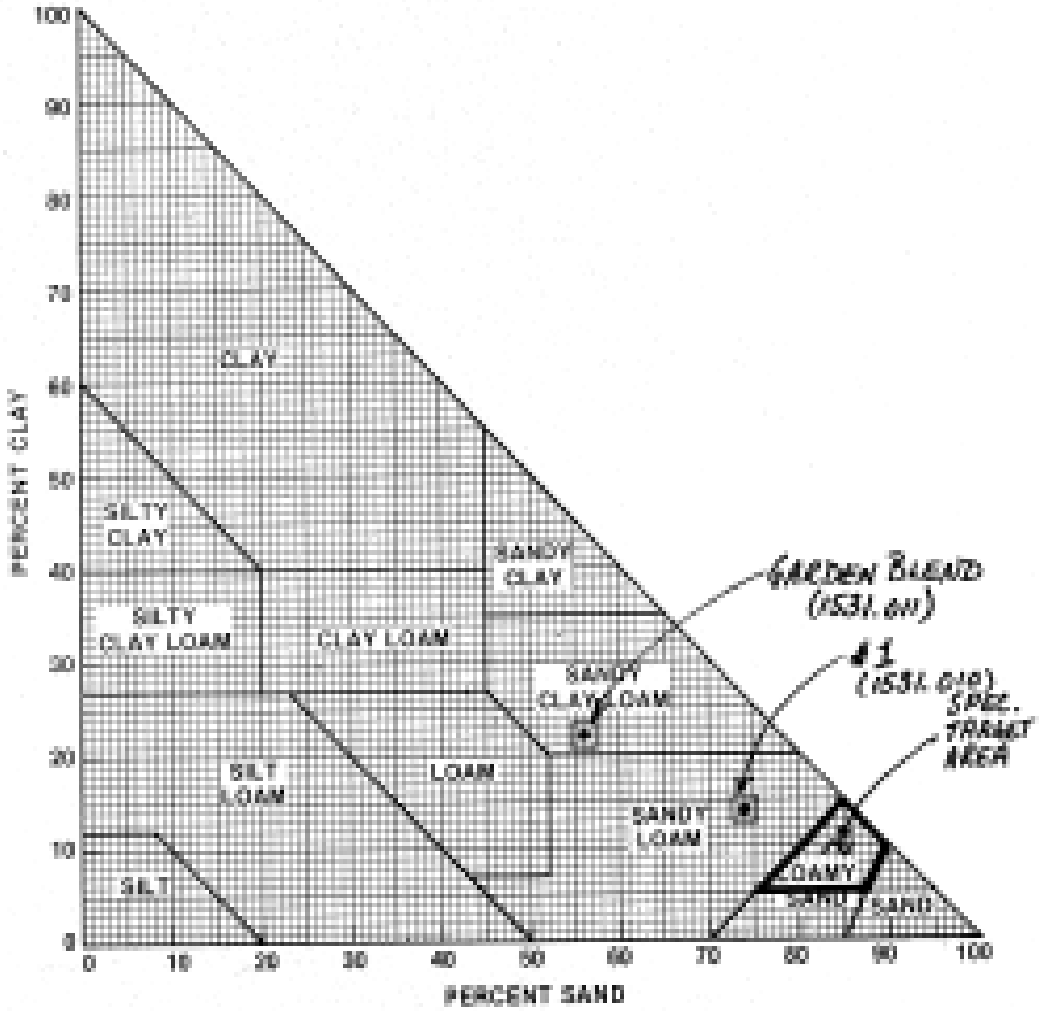

Fig. 15-3. Textural triangle for soil textural analysis using the USDA classification scheme.

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Economic Opportunities

- New end product markets with Bio Soil Mixes
  - Opportunity to “raise the bar” in soil quality produced
  - Chance to source new, appropriate alternative materials
    - Recycled aggregate
    - Recycled sands (foundry sand)
  - Sustainable Sites Initiative

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New Feedstock Opportunities

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Organic Industrial Residuals

- Fly ash
- FGD
- Foundry sand
- Alum sludge
- Gypsum sludge
- Spent lime
- Steel slag
- Papermill sludge

Foundry Sand

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Ginny Black

Minnesota Pollution Control Agency

US Composting Council Board of Directors

And

Plymouth City Council

Projects

- Demonstration Project (compost blanket)
- Wood Creek (compost blanket)
- Raingardens (engineered soil mix)
- Shoreland Restoration (compost incorporation)

When to consider Compost.

- Poor quality soils that will not support vigorous rapid growth.
- Projects completed late in the season
- Locations that are steep or hard to reach with heavy equipment
- Areas where weed control cannot be used
- High profile areas where immediate results are needed
- May be able to get GHG credits

General Benefits

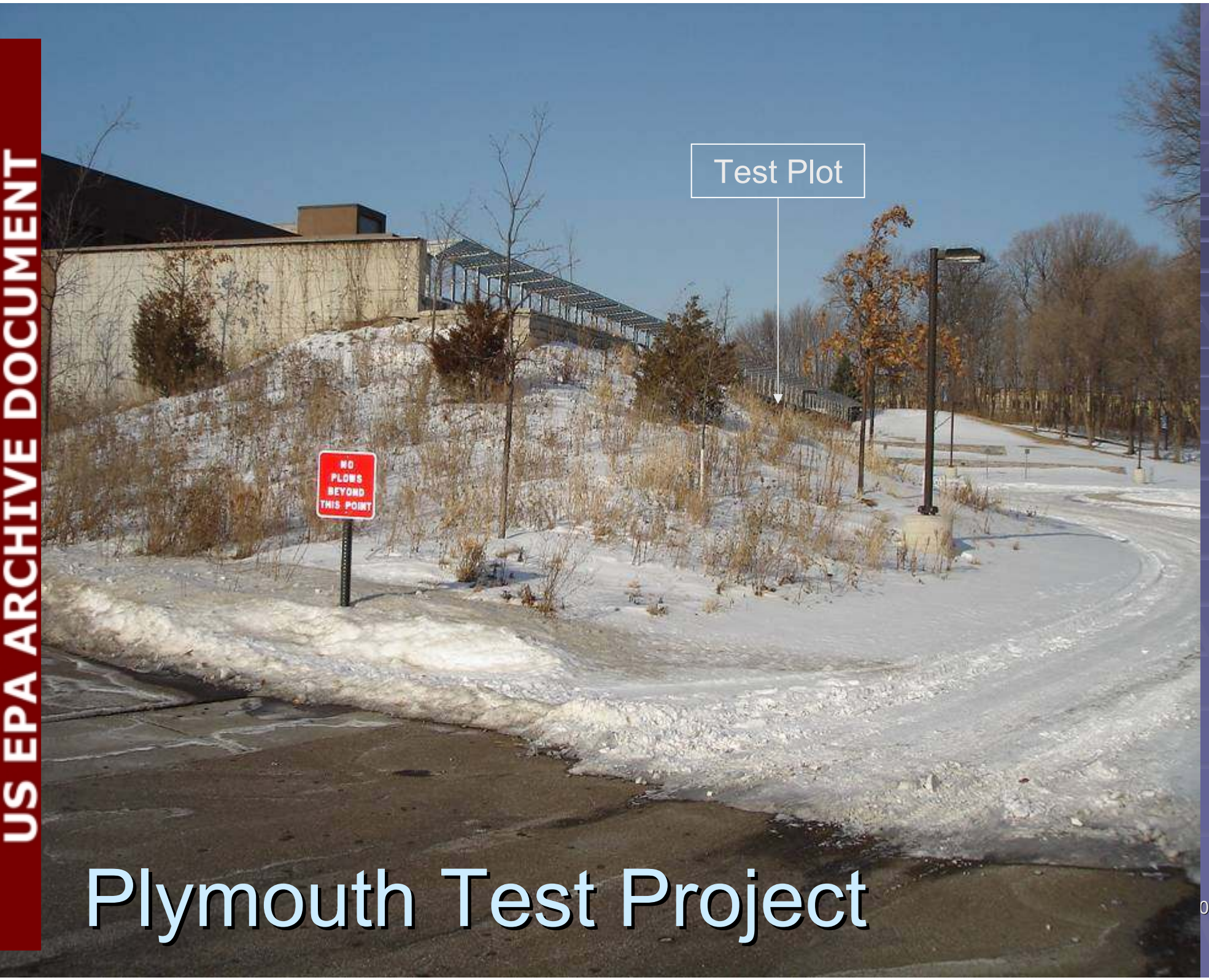
- Weed free source of organic matter.
- Promotes plant growth and rooting.
- Great moisture holding capabilities.
- Contains low levels of nutrients.
- Disease suppression qualities.
- Can fix poor soils, physically, and biologically.

Storm Water Management & Erosion Control

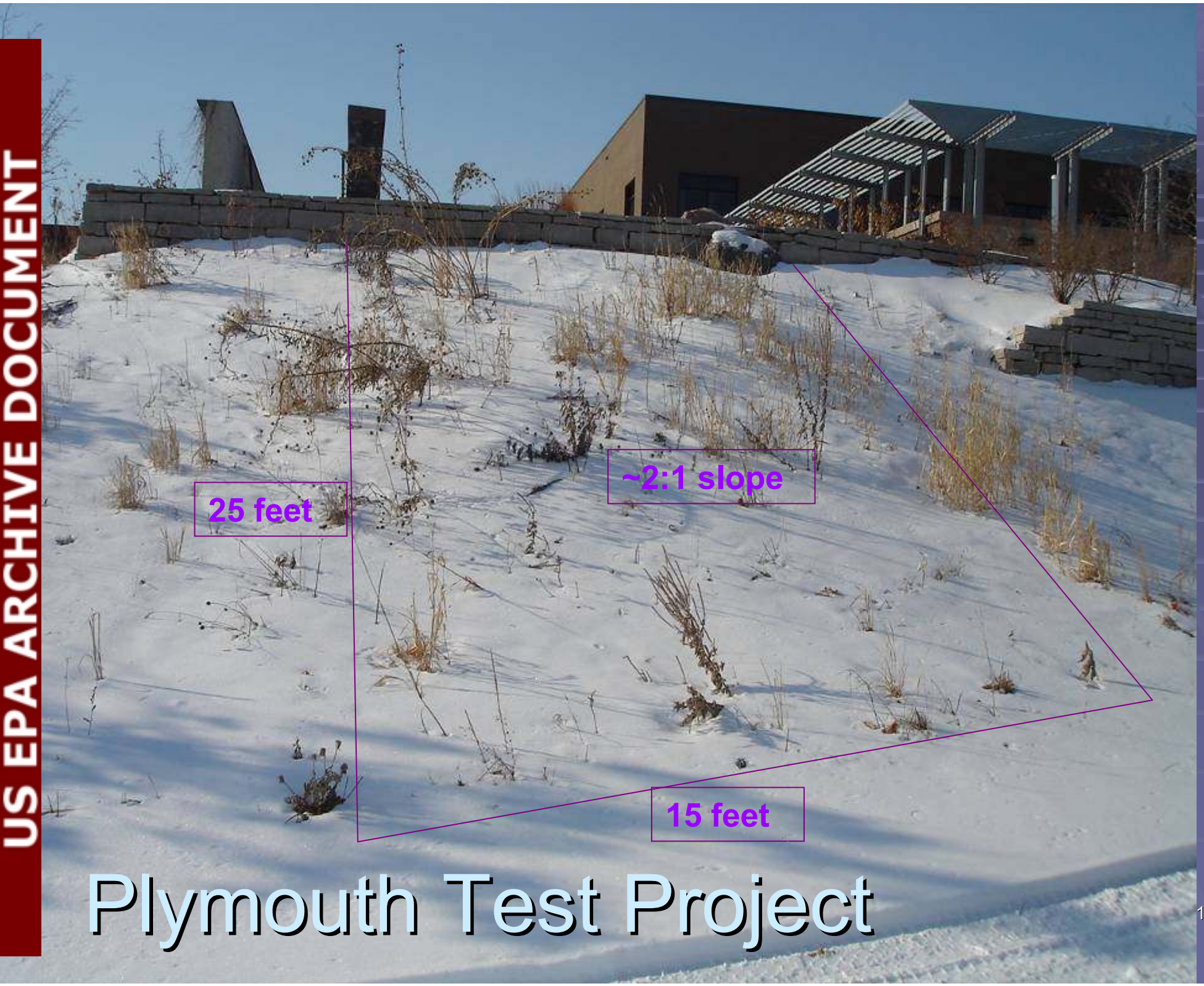
- Water retention
  - 10 lbs compost holds 8 lbs water
  - Reduces runoff/erosion
- Quick Re-vegetation

Plymouth Test Project

- Public Safety Expansion
- Native plantings
- Steep slope 2:1
- First planting very thin
- Highly eroded
- Very Public site



Plymouth Test Project



Plymouth Test Project

Plymouth Test Project

- Test plot of yard waste compost/pond storm water dredgings
- First year no growth, no erosion
- Second year prolific black-eyed susans
- Third year, heavy fall leaf layer prevent flower growth, mainly green vegetative growth

Wood Creek

- Tributary stream to Medicine Lake, listed as impaired for Phosphorus
- Plated as a wooded out lot to an HOA, 1970's
- Sever erosion
- Endangered decks and homes
- Deposition of lg. alluvial fan in Medicine Lake

Picture courtesy of City of Plymouth

est end of project

Picture courtesy of City of Plymouth

ddle West end of project

ddle East end of project

Picture courtesy of City of Plymouth

ddle East end of project

ddle East end of project

Picture courtesy of City of Plymouth

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Plymouth Rain Gardens

Plymouth Raingardens

- Surface Water Management Plan of 2000
- Surface Water Management Fee, 2002
- Commercial Rain Gardens, 2004
- Residential with Road Reconstructions, 2003 to present

Plymouth Rain Garden Spec.

- Soil Amendment
  - 70/15/15 on-site soil/compost/sandy soil mix.
- Mulch
  - shredded raw wood material from hard timber
  - No individual piece shall exceed 5” in any direction.
- Edging
  - commercial grade, 4” x 1/8”, Green Steel Edging by Sure Loc or approved equal
- Drain tile
  - 4” in diameter filter sock, connected with a 4” x 4” x 4” TEE to drain tile in the street or a nearby catch basin as specified on the construction plans or in the field

Nursery Plant Stock

- Shrubs (Gallon Pots)
- Annabelle' Hydrangea
- Emerald Mount' Honeysuckle
- Viburnum "Bailey Compact" (V. trilobum)
- Perennials (4" Pots)
- Sedum 'Autumn Joy'
- Liatris 'Floristan Violet'
- Daylily 'Lemon Lollypop'

Blue Flag Iris (Iris versicolor)

- Black-eyed Susan "Goldstrum'
- Aster 'Alma Potschke' (A. novae-angliae)
- Aster 'Purple Dome'
- Feather Reed Grass 'Karl Forester'
- Little Bluestem

2003 Raingarden – Street Recon Project

2003 Raingarden – Street Recon Project

2004 Street Recon Rain Garden – Larch Lane and 46th Av. N.

2006 Plants, Ponds and Practices Tour, 2005 Street Recon

2005 Street Recon Rain Garden Project – Southwest Plymouth

Shoreline Restoration – West Medicine Lake Park

Shoreline Restoration – West Medicine Lake Park