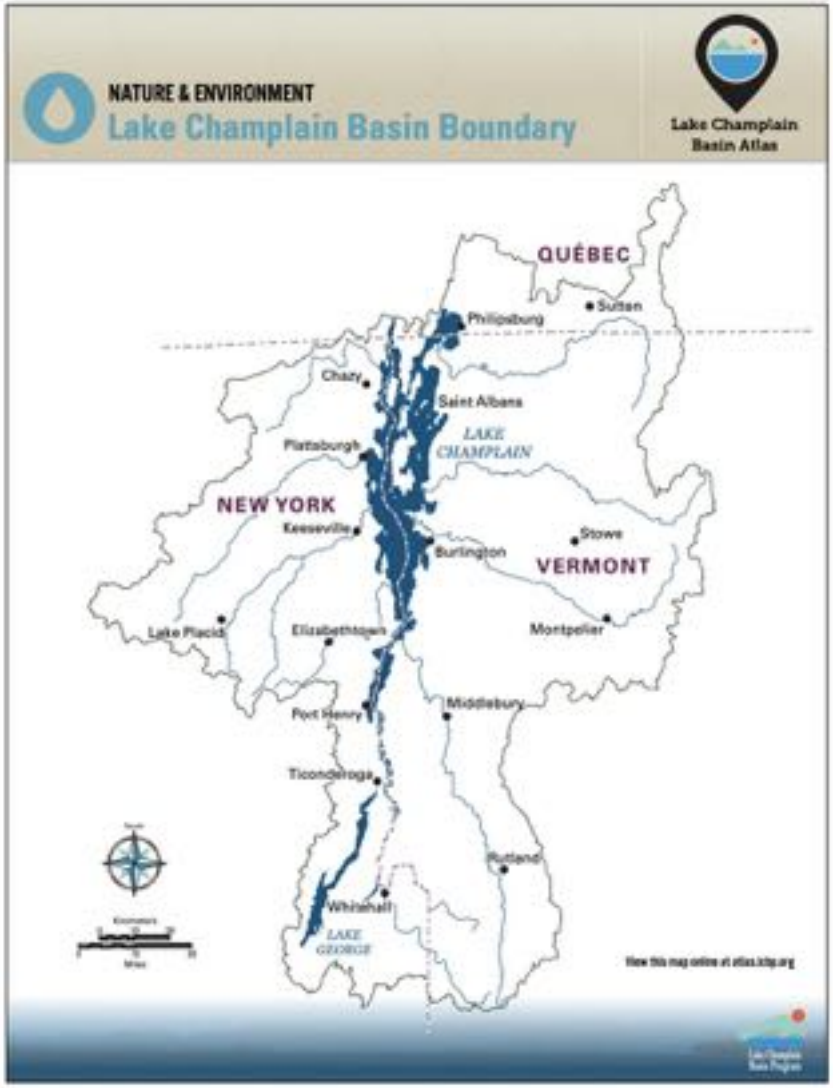
Soil Builders – Education in Action
Best Management Practices for Compost & Compost-Based Products

Soil Builders Workshops

Compost-related eco-literacy for Lake Champlain Basin decision-makers, professionals and advocates.

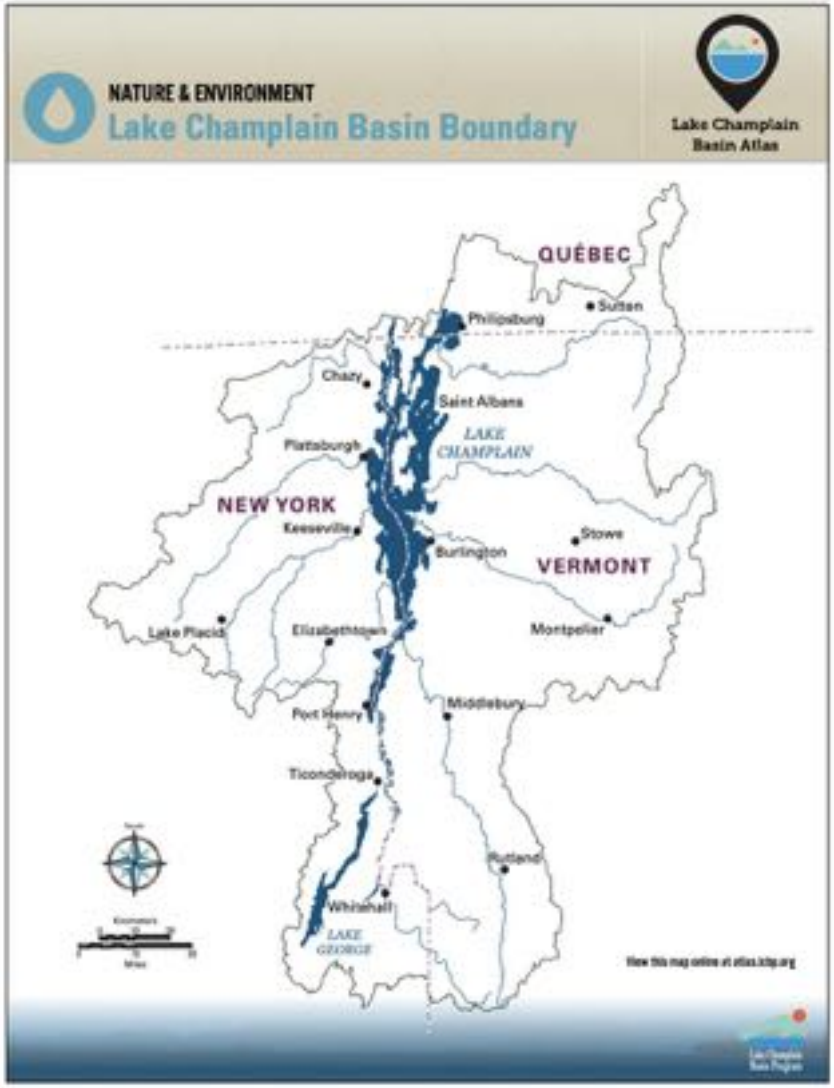
Compost increases soil stability, fertility, water infiltration, and moisture retention.

Using compost in land management practices is a critical strategy for climate adaptation.



Soil Builders Workshop Topics

- ✔ Soil health & water quality
- ✔ Drivers for clean water & healthy soil
- ✔ **Best Management Practices for compost & compost-based products**
- ✔ Education in action – next steps



Project Partners

- Athena Lee Bradley, Compost Consultant, CAV Board Member
- Marc Companion, Lake Champlain Sea Grant
- Chuck Duprey, Naturcycle
- Brian Jerose, Agrilab Technologies Inc., CAV Board Member
- Deb Neher, UVM
- Elly Ventura, Lamoille Regional Solid Waste Management District, CAV Board Member

Additional Thanks

- CAV Board of Directors

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Soil Builders – Education in Action
Best Management Practices for Compost & Compost-Based Products

- Chuck Duprey, Naturcycle
- Brian Jerose, Agrilab Technologies Inc.



Compost Best Management Practices

- The best management practices of compost come from trade groups including:
  - US Composting Council
  - American Association of State Highway Transportation
  - International Erosion Control Association
  - Universities study & research different applications
- Choosing and tailoring solutions that best serve the Lake Champlain Basin
- Best Practices are based on consistent, replicable approaches

✔ **The place to start is the specification for the compost to be used**

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

AASHTO

THE VOICE OF TRANSPORTATION

US Composting Council®

Proud Member

US Composting Council®

Proud Member

I'm a Soilbuilder!

IECA

International Erosion Control Association

The University of Vermont

Four critical segments of Compost Uses

- Landscaping and athletic fields
- Direct erosion control for construction or roadside
- Low nutrient applications (bio-retention)
- Agriculture

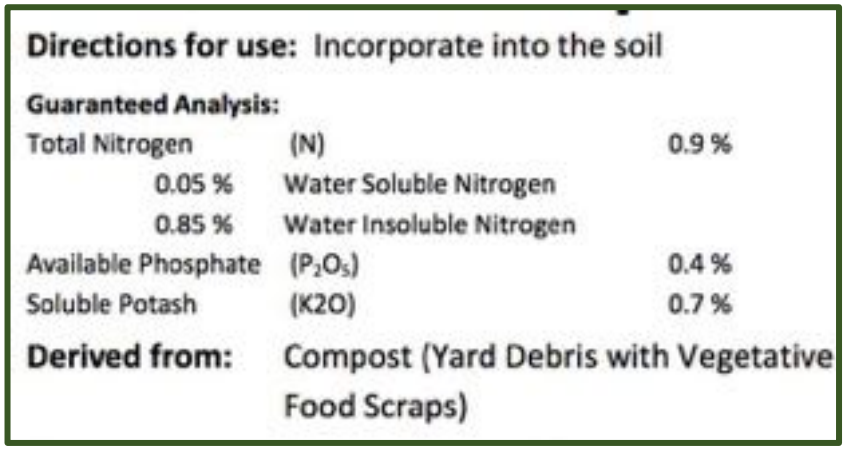
Compost & Compost Products

- Not all composts are created equal
- Physical properties of compost – particle size
- Aggregated compost fibers with some fertility
- Look for sample analysis results




Compost Labeling

- Nutrient claims – N-P-K guaranteed or typical analysis
  - Nitrogen range 0.2 to 2 % by weight, 0.5 % average
  - Phosphorus range 0.1 to 2% by weight, 1% average
  - Potassium range 0.1 to 2% by weight, 1 % average



Directions for use: Incorporate into the soil

Guaranteed Analysis:

Total Nitrogen	(N)	0.9 %
0.05 %	Water Soluble Nitrogen	
0.85 %	Water Insoluble Nitrogen	
Available Phosphate	(P_2O_5)	0.4 %
Soluble Potash	(K2O)	0.7 %

Derived from: Compost (Yard Debris with Vegetative Food Scraps)

- N may not all be immediately available in first year of use because of slower release of nutrients from organic-N
- Primary impact on nutrient content: source materials
  - Composting and handling methods affect N levels

Compost Sampling & Analysis

- What parameters matter in a sample?
- Who conducts sampling and analytical work?
- What other background information is important?
- How does human activity at end use location influence the compost selected?
- How confident can you be in sample results?

https://www.compostfoundation.org/Education/Sampling-Videos

Compost Assurances

- Seal of Testing Assurance – US Composting Council; based on testing range of parameters
- Rodale Organic Gardening Approval – voluntary based on material inputs and testing results
- Approved for organic use – compost from non-synthetic sources & produced according to USDA guidelines, approved by NOFA-VT/NY, OMRI, other certifiers
- Class A Biosolids – Municipal biosolids that achieve pathogen reductions and stay below heavy metal limits

Best Management Practices in Landscaping & Athletic Fields

Compost Utilization in Landscaping & Athletic Fields

- Mixing with soil when revegetating a site disturbed by excavators, bulldozers or other equipment
- Mixing with roots in new tree and shrub planting to decrease soil bulk density
- Topdressing
- Mulching new plantings of flowers, plants, trees and shrubs for moisture control, slow-release fertility and weed suppression

Compost Utilization in Landscaping & Athletic Fields

- Compost improve a soil's physical, chemical or biological characteristics
- Two useful specifications:
  - US Composting Council
  - US Golf Association

General Landscape Specification

GENERIC Use Compost Specification (Like Amending Soil in Place)

1. Soil Amendments – Compost

Compost is a product manufactured through the controlled aerobic, biological decomposition of biodegradable materials. The product has undergone mesophilic and thermophilic temperatures, which significantly reduces the viability of pathogens and weed seeds, and stabilizes the carbon such that it is beneficial to plant growth. It should meet or exceed all requirements to distribute in the State the compost is produced, and come from a facility that is registered and or permitted by its State department that regulates composting.

Physical/Chemical Requirements Property Test Method Requirements for Compost Specifications

Required Ranges	Test	Test Method**	Units
5.5 to 8.0	pH	TMECC 04.11-A	pH
< 6.00	Soluble Salts	TMECC 04.10-A	dS/m (mmhos/cm)
20-65%	Moisture Content	TMECC 03.09-A	% Wet Weight Basis
25 - 75%	Organic Matter Content	TMECC 05.07-A	% Dry Weight Basis
Percent Emergence: > 85%	Maturity	TMECC 05.05-A	% Relative to Positive Control
Vigor: > 90%	Maturity	TMECC 05.05-A	% Relative to Positive Control
"Stable or Very Stable"	Stability	TMECC 05.08-B	mg CO2-C/g OM per day
> 90%	Particle Size^^	TMECC 02.02-B	% Dry Weight Basis

Compost Maturity & Stability

If a compost is finished, is it mature (ready for use)?

- Color, Odor, C:N, pH, Time
- Bioassays

Images: A&L Great lakes labs

Compost Maturity & Stability

If a compost is finished, is it mature (ready for use)?

- Solvita or CO_2 respirometry

Finished stable compost:

- ✔ Doesn't rob soils of nutrients
- ✔ Grows healthy plants
- ✔ Does not have as much water soluble nutrients

Images: A&L Great lakes labs

General Landscape Specification

Physical/Chemical Requirements Property Test Method Requirements for Compost Specifications

Required Ranges	Test	Test Method**	Units
Percent Emergence:			
> 85%	Maturity	TMECC 05.05-A	% Relative to Positive Control
Vigor:			
> 90%	Maturity	TMECC 05.05-A	% Relative to Positive Control
"Stable or Very Stable"	Stability	TMECC 05.08-B	mg CO2-C/g OM per day
> 90%	Particle Size^^	TMECC 02.02-B	% Dry Weight Basis
< 0.50 %	Foreign Material	TMECC 03.08-A	% by Weight

**All methods are from the Test Methods for the Evaluation of Compost and Composting (TMECC).

^^ Particle size is based on passing a 9.5 mm screen roughly 3/8" 95% plus passing is common

Standard of Compost Quality:

1. Approved compost may demonstrate involvement in the US Composting Seal of Testing Assurance (STA) Program via a certified independent analysis as provided by a laboratory participating in STA Program. Along with being a participant in good standing and the ability to produce the required annual test reports. A recent (within 90 days of project start) STA Technical Data Sheet is required to be submitted prior to shipment of compost.

2. If not enrolled in the STA program the material may be test to equivalent standards no more than 120 days from project start date.

3. Solvita ® Compost Maturity testing is an acceptable alternative for Maturity and Stability testing of a compost when conducted by a laboratory on a composite sample.

General Tips & Tricks

- Ask for a physical sample prior to delivery
  - A quart will ensure it's the right compost for the job
- Delivery options often affect pricing dramatically
  - Larger loads offer the lowest cost per yard
- There are creative ways to deliver compost for lawn & landscape applications
- Note: inverse weed pressure can develop
  - Improving soils can lead to some weed development if not planted & mulched quickly

Super Sacks can store on site

Installation of Compost for Fill

- Blended into soils off site – used as fill
- Delivered to a site & mixed with soil
  - Entire area has 1-2” of compost applied
  - Till applied compost into on-site soil
  - Compost incorporated to depth of 5-8” or to rootzone of plants

- Provides good base for establishing turf or other vegetation after disturbance of a site
- pH and other parameters of compost-amended soil must support specific plants

Use of Compost for Backfill

- Engineered soils for “rootzone” often include compost
  - 2 parts soil to 1 part compost
- Place around trees, shrubs, potted plants
- Provides fertility & lower bulk density



When to Apply Compost

- When backfilling or mixing to make amended soils
  - ✔ Most times of year (except winter work)
  - X Avoid saturated wet conditions
  - X Too dry can also be an issue
- Testing and required reports can take time - accounting for this in project timeline is critical

Operation & Maintenance

- Using compost =
  - Reduced fertilizer applications
  - Increased vegetation success rates
  - Decreased soil erosion & runoff
- Compost can be stored on site for a month or longer if protected
  - Lightly tarped, keep direct water away, clean area to keep debris away
- The better compost is mixed with the soil, the better success

Contractors & Materials

- Most contractors and installers
  - soil blending or fill incorporation
- Compost can be purchased from:
  - manufacturer
  - distributors
  - retail outlets like landscape supply yards, nurseries, etc.
- US Composting Council map or Findacomposter.com

Topdressing with Compost

- Topdressing:
  - High end athletic fields
  - Golf courses
  - Home or commercial turf stands
- Requires the right compost parameters & often proper equipment for applications

Topdressing with Compost

A regular turf maintenance program that includes core aerification and topdressing with a finely screened compost product will provide a healthier and more durable turf area. It will be better able to withstand the stresses of drought and overuse. Compost addition to soils will:

Reduce compaction
Help control thatch
Encourage water movement into the soil

*(According to Association of American Plant Food Control Officials AAPFCO)

Topdressing Procedure

1. Apply approximately ¼" to ½" of finely screened compost (3/8" minus or less) evenly over turf surface using a topdressing unit, manure spreader or other suitable equipment.
2. Aerify heavily (2 to 3 passes) with an aerifier equipped with ¾" cores.
    a. Aerify alternatively with deep tine aeration, or other no pull core methods, proceed to step 4.
3. Smooth the area with a drag mat break up cores and backfill holes.
4. Apply seed, if desired, using a vertiseeder, or broadcast spreader, and seed mixture of your choice.
5. Apply water at standard rates (**recommended where possible for applicator**).

Topdressing should ideally be completed twice per year, in the late spring and early fall. Mowing after application and before any use may help break up any small compost pieces left behind. **Compost application should not occur on days with temperatures exceeding 80 degrees, or within the 48-hour forecast.**

Topdressing with Compost

Basis of Compost Acceptable suitable for use in Topdressing –

A) US Composting Council Seal of Testing Assurance participating compost and or

B) A well-made stable compost showing recent test results should be no more than 60 days old from date of application.

Compost Parameters to use for top dressing:
Testing may be conducted via TMECC (Test Methods for the Evaluation of Compost and Composting) methods by an accredited lab:

Test	Acceptable Ranges	Test Method
pH	6.0 to 8.0	TMECC -04.11-A
Soluble Salts or E/C:	0.5 to 5 ds/m	TMECC -04.10-A
Organic Matter:	30-75%	TMECC -05.07-A
Particle Size:	> 92% passing (3/8 in)	TMECC – 02.02-B
Maturity(Respirometry):	≤ 2/3 or Stable / Verry Stable	TMECC – 05.08-B or Solvita®

How to Topdress with Compost

- Directly by installer
- Sub-Contractors
  - Turf applicators
  - Landscapers
  - Blower truck companies

✔ Particle size is critical

✔ Spread evenly & don't over apply

✔ Can blend in micronutrients & pH amendments

Calculating Application Rates

- ¼” depth equals 33 cubic yards/acre
- 1” depth equals 133 cubic yards/acre
- 1” depth equal 3.1 cubic yards/1000 square feet

- Application Rate Calculators, such as greenmountaincompost.com/compost-calculator

Timing for Topdressing

- Late fall/early winter applications are best
  - Hot summer temperatures can burn the tops of grass
- Avoid over compacting soils
- Delivery of material just prior to use
- Note: sourcing can be slower as it's a specialized compost particle size

Operations & Maintenance

- On sand-based soils, alternating between annual sand and compost applications is recommended
- Over accumulation of organic matter can be an issue
  - 10+% organic matter can lead to excess water holding & issues with anaerobic conditions
- Significantly reduces fertilizer applications (based on compost analysis)

Tips and Tricks

- Air temperatures do matter
- Finding clean, right-sized compost is critical
- Calibrating the spreader is an important step
  - Each has its own instructions but you can calculate application rate per square foot with a large sheet cardboard

Cost Comparison

- It is harder to apply then liquid or granular fertilizer
- Topdressing larger areas bring costs more in-line with traditional methods
- Does not require certified applicator
  - VT and NY require a license for applying fertilizer but not for applying compost

Examples of Topdressing Residential Lawn

Examples of Topdressing a Lawn

Vermont Case Study: Enosburg Falls HS Athletic Fields

- Applied 5 cubic yards (135 cu. feet) to 3600 square feet of established baseball outfield grass, sandy loam soils
- 1 cubic foot covers about 27 sq. ft. at a depth of 0.44 inches (less than ½")
    - ~1600 cubic feet per acre (59 cy/acre)
- Recommend 20-30 cy per acre on established turf grass on targeted areas – 50% or less than EFHS trial
- Material cost $625/acre at 25 cy/acre at $25/cy (2006)
- Benefits compacted areas by decreasing bulk density through organic matter additions plus fertility inputs – makes soil looser – best results with finer particle sizes

Athletic Field Before Compost Application

During Compost Application

Close up of heaviest application

After Compost Application & Next Day

Aerator & After Application

Greener Grass in Application Strip

Compost-Based Mulch

- Composted yard trimmings, ground wood, coarser-textured composts
- Application rate: 2-3” layer (6-9 cubic yards/1000 square feet)
- Moisture conservation, weed control, aesthetics
- Protects soils from rainfall impact & runoff; decreases soil erosion

Compost Mulch Vs. All-Wood Mulch

- (Uncomposted) carbon materials can rob nutrients from the soil as it breaks down
- Composted material or a blend of compost and wood mulch can release nutrients to feed plants and adds beneficial microbes to improve soil health
- Very coarse overs from screening could be marketed as a mulch product
- Some mulch users blend in dark colored compost to darken mulch and speed its breakdown
- Compost as mulch is more common than some may think (Sweet Peat® is marketed throughout the NE)

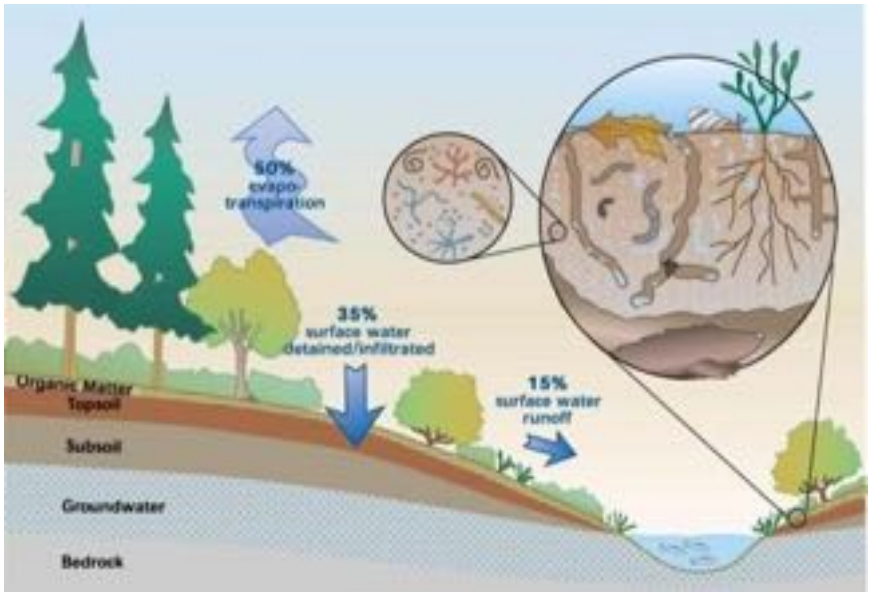
Summary of Benefits

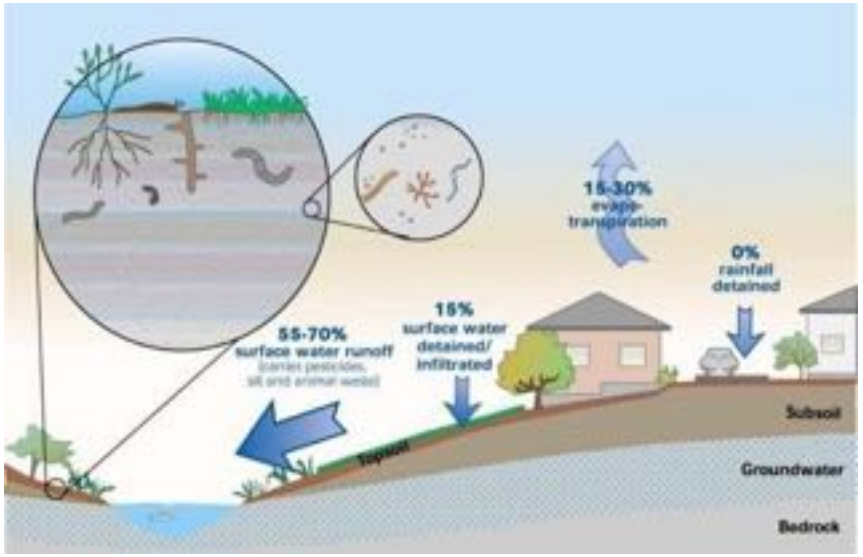
- Improves long-term performance of turf and other plantings
- More sustainable approach, fertilizer is a huge CO_2 source
- Compost provides a slow release nutrient source
- Offers wider benefits than fertilizer (compost improves soil biology & physical characteristics)
- Using local materials supports organic diversion programs & local compost producers

Best Management Practices for Erosion Control

Stormwater Management

- Practices are evolving
  - Decline in ecosystem functions
  - From simply managing quantity (retention basins) to quality AND quantity
- Mimicking nature: focus on <u>infiltration</u>, <u>evaporation</u>, & <u>transpiration</u>





VT Stormwater Permit Requirements

Erosion Prevention & Sediment Control

- Capture/filter runoff – perimeter & inlet control
- Runoff Reduction – site stabilization is required

Post-construction soil quality requirement

- Amend disturbed soil to 4+% OM content

Municipal Roads General Permit Requirements

- Stabilize road drainage systems
- Reduce potential road pollutants (excess nutrients, sediment, trace heavy metals, hydrocarbons, road salt)

Road Construction Remediation

- Stabilization of cuts and banks from highways, local roads or on-site driveways and access lanes
- Compost added to topsoil improves speed of revegetation and density of growth
- Compost as surface cover (blanket) acts as temporary surface mulch to protect surface prior to revegetation
- Capacity of soils to infiltrate and then retain moisture improves with higher organic matter content
- VTrans used compost blanket on Rt.15 trial

Direct Erosion Control for Construction or Roadside

- Three critical uses of compost:
  - Erosion control blankets
  - Compost berms
  - Filter socks

✔ Coarse material is best for these applications

Erosion Control: Overview of BMPs

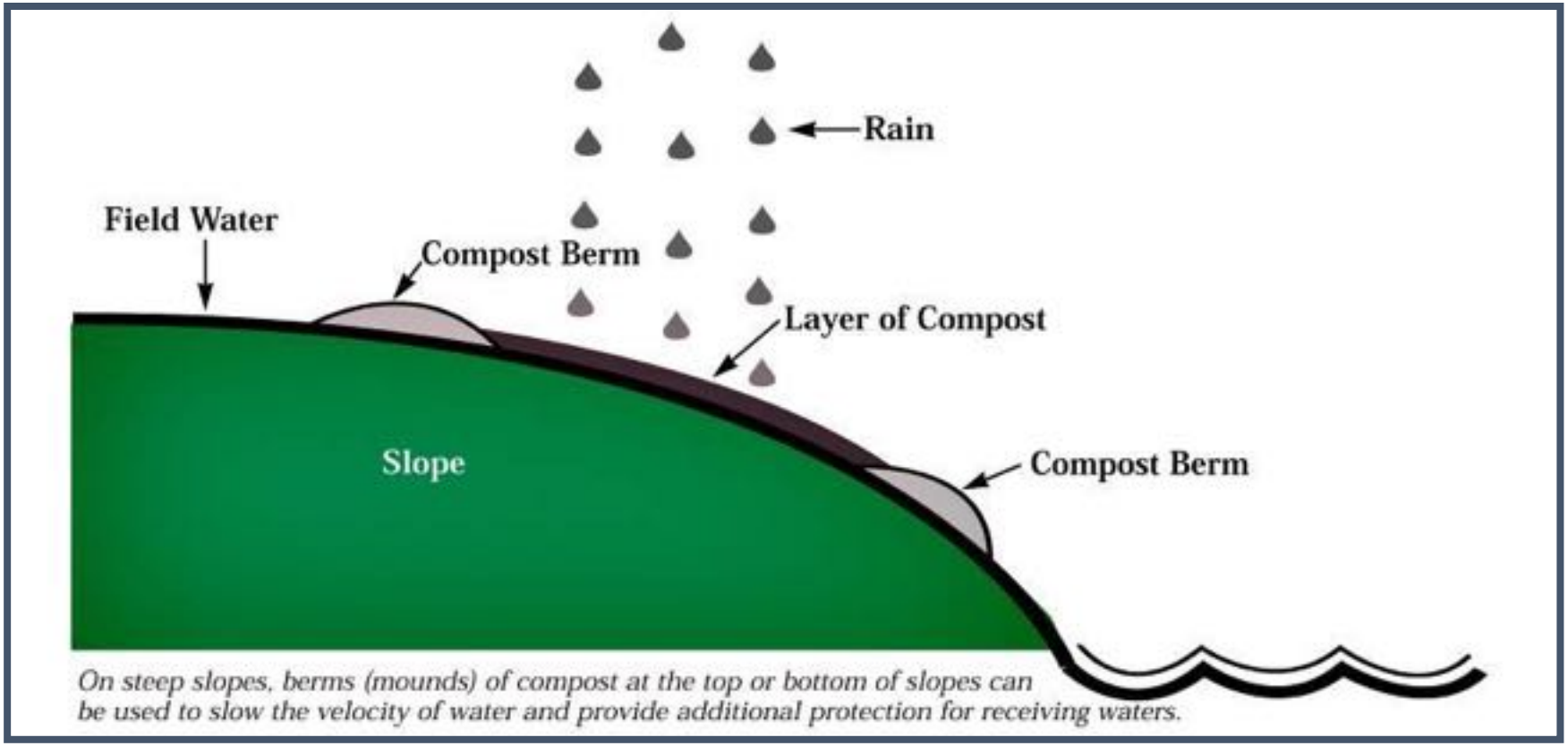
- Compost blankets are 2-part specifications
  - Blanket
  - Berm (or sock) for edges

- Compost filter socks have multiple uses
  - Silt fence alternative
  - Ditch check
  - Part of a compost blanket system
  - Stream bank restoration
  - Protection for stockpiles of soil (on construction sites)
  - DOT and commercial construction applications abound!

Compost-Based Erosion & Sediment BMPs

- Compost Berm and Sock: Pollutant removal
- Compost Blanket: Pollution prevention
- AASHTO Specifications MP-9 and 10
- Need coarse particle size to allow flow, resist movement
  - Composted mulch or screened “middles”
  - 30-60% (by wt) passing ¼” screen

Compost Blankets & Berms



American Society of State Highway and Transportation Officials Specs – CompostforLAs.com

Table 1 – Compost Blanket Parameters

Parameters[1,4]	Reported as (units of measure)	Surface Mulch to be Vegetated	Surface Mulch to be left Un-vegetated
pH[2]	pH units	5.0 - 8.5	N/A
Soluble Salt Concentration[2] (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	% passing a selected mesh size, dry weight basis	• 3" (75 mm), 100% passing • 1" (25mm), 90% to 100% passing • 3/4" (19mm), 65% to 100%passing • 1/4" (6.4 mm), 0% to 75% passing • Maximum particle length of 6" (152mm)	• 3" (75 mm), 100% passing • 1" (25mm), 90% to 100% passing • 3/4" (19mm), 65% to 100%passing • 1/4" (6.4 mm), 0% to 75% passing • Maximum particle length of 6" (152mm)
Stability[3] Carbon Dioxide Evolution Rate	mg CO_2-C per g OM per day	< 8	N/A
Physical Contaminants (man-made inerts)	%, dry weight basis	< 1	< 1

[1] Recommended test methodologies are provided in Test Methods for the Examination of Composting and Compost (TMECC, The US Composting Council)

[2] Each specific plant species requires a specific pH range. Each plant also has a salinity tolerance rating, and maximum

The following steps shall be taken for the proper installation of compost as a soil blanket for erosion/sediment control on sloped areas.

Slightly roughen (scarify) slopes and remove large clods, rocks, stumps, roots larger than 2 inches in diameter and debris on slopes where vegetation is to be established. This soil preparation step may be eliminated where approved by the Project Engineer or Landscape Architect/Designer, or where seeding or planting is not planned.

Where practical, track (compact) perpendicular to contours on the slope using a bulldozer before applying compost as soil blanket.

Apply compost at the rates specified in Table 2.

Table 2 – Compost Blanket Application Rates

Annual Rainfall/Flow Rate	Total Precipitation & Rainfall Erosivity Index	Application Rate For Vegetated* Compost Surface Mulch	Application Rate For Unvegetated Compost Surface Mulch
Low	1-25", 20-90	½ - ¾ " (12.5 mm - 19 mm)	1" – 1 ½" (25 mm – 37.5mm)
Average	26-50", 91-200	¾ - 1" (19 mm - 25 mm)	1 ½" – 2" (37 mm – 50 mm)
High	51" and above, 201 and above	1-2" (25 mm - 50 mm)	2-4" (50mm – 100mm)

*these lower application rates should only be used in conjunction with seeding, and for compost blankets applied during the prescribed planting season for the particular region.

Compost blanket application rates should be modified based on specific site (e.g., soil characteristics, existing vegetation) and climatic conditions, as well as particular project related requirements. The severity of slope grade, as well as slope length, will also influence compost application rates.

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Compost blanket application rates should be modified based on specific site (e.g., soil characteristics, existing vegetation) and climatic conditions, as well as particular project related requirements. The severity of slope grade, as well as slope length, will also influence compost application rates.

In regions subjected to higher rates of precipitation and/or rainfall intensity, higher compost application rates should be used. In these regions, as well as those with spring snow melt, and on sites possessing severe grades or long slope lengths, the compost blanket may be used in conjunction with a compost filter berm. The filter berm may be 1-2 feet high (30 cm – 60 cm), by 2-4 feet wide (60 cm – 120 cm), and may be placed at the top or base (or both) of the slope. In these particular regions, as well as regions subject to wind erosion, coarser compost products are also preferred.

In regions subject to lower rates of precipitation and/or rainfall intensity, lower compost application rates may be used. Specific regions may receive higher rainfall rates, but this rainfall is received through low intensity rainfall events (e.g., the Northwestern U.S.). These regions may use lower compost application rates.

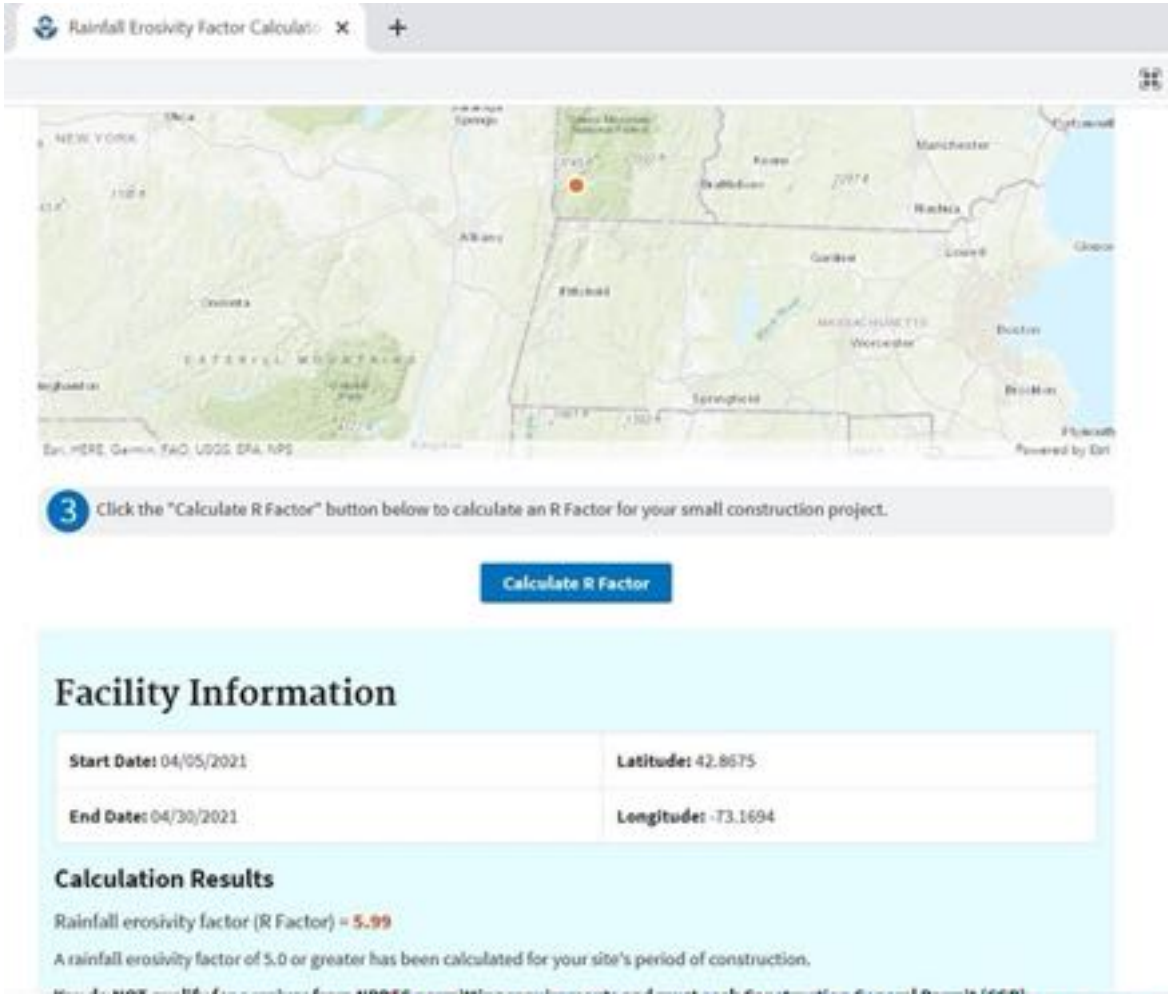
Compost shall be uniformly applied using an approved spreader unit, including bulldozers, side discharge manure spreaders, etc. Alternatively, apply compost using a pneumatic (blower) unit, or other unit that propels the product directly at the soil surface, thereby preventing water from moving between the soil-compost interface. Thorough watering may be used to improve settling of the compost. Apply compost layer approximately 3 feet (90 cm) over the top of the slope, or overlap it into existing vegetation.

On highly unstable soils, use compost in conjunction with appropriate structural measures.

Dry or hydraulic seeding may be completed following compost application, as required, or during the compost application itself, where a pneumatic unit is used to apply the compost.

Rainfall Erosivity Factor Calculator

- Based on kinetic energy considerations of falling rain
- A measure of erosive force & intensity of rain in a normal year
- [lew.epa.gov](lew.epa.gov)
  - Start & end date of construction
  - Address



How Compost Blankets Work

Slopes with soil

- Rolls downhill
- Speed/mass displaces other soil particles
- Rills are formed
- Speed increases due to channeling of water
- Channels are formed
- Gully erosion

Slopes with compost

- Compost is flat, flexible and mesh-like
- 'Knits' together on slopes
- Softer, does not roll
- Similar to a 'wet deck of cards' on the slope
- Porous enough to allow water to pass through slowly

How to Install a Compost Blanket

- Spread with dozer on moderate slopes
- Slinger truck
- Blower truck
- Applies more like mulch
- Can hydroseed over it

Compost Blanket Installation

Compost Berms

Compost Filter Berm

FIELD APPLICATION

The following steps shall be taken for the proper installation of compost as a filter berm for erosion/sediment control on both level and sloped areas.

Parallel to the base of the slope, or around the perimeter of affected areas, construct a trapezoidal berm at the dimensions specified in Table 2. In general, when compost filter berms are used to control erosion/sediment near, or on a slope, the base of the berm should be twice the height of the berm.

Compost shall be applied to the dimensions specified in Table 2.

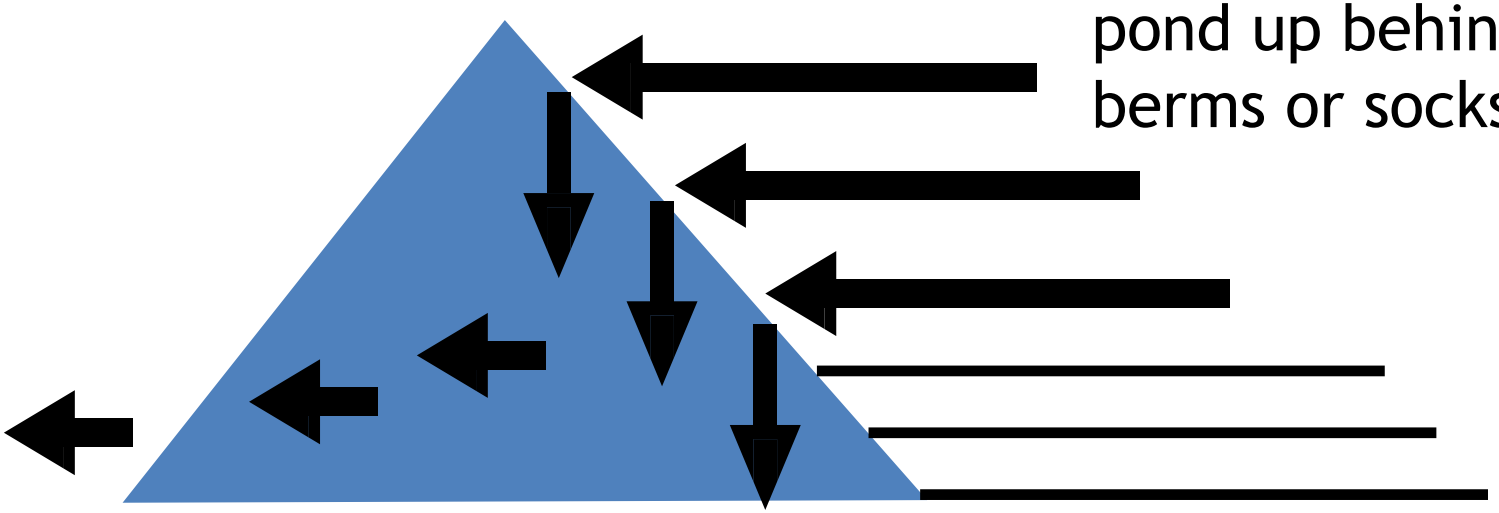
Table 2 ± Compost Filter Berm Dimensions

Annual Rainfall/Flow Rate	Total Precipitation & Rainfall Erosivity Index	Dimensions for the Compost Filter Berm (height x width)
Low	1-25',	1,x 2, ± 1.5, x 3,
	20-90	(30 cm x 60 cm ± 45 cm x 90 cm)
Average	26-50',	1,x 2, - 1.5, x 3,
	91-200	(30 cm x 60 cm ± 45 cm x 90 cm)
High	51' and above, 201 and above	1.5,x 3, ± 2, x 4, (45 cm x 90 cm ± 60cm x 120 cm)

Compost filter berm dimensions should be modified based on specific site (e.g., soil characteristics, existing vegetation) and climatic conditions, as well as particular project related requirements. The severity of slope grade, as well as slope length will also influence the size of the berm.

In regions subjected to higher rates of precipitation and/or rainfall intensity, as well as spring snow melt, larger berms

Berms: 'Geometrically Superior'



High runoff flows pond up behind berms or socks

Berms are three-dimensional filters

Sediment fills up behind berm

Filter Berm in Pennsylvania

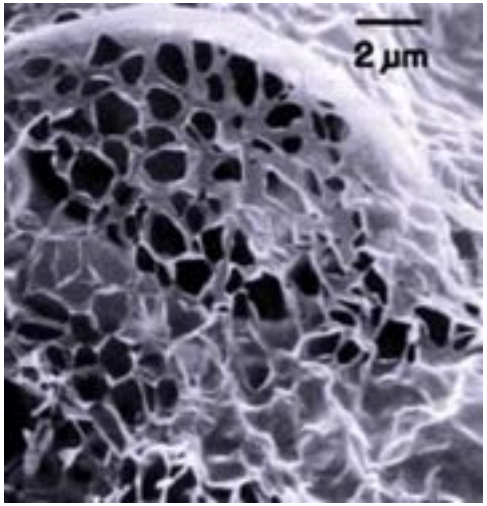
Cost Estimates: Compost Berms

- Material: $2.61 - $3.15/linear foot
- All-in: $7.50 - $8.12/linear foot (includes materials and installation, inspection and sediment removal, repair and replacement)

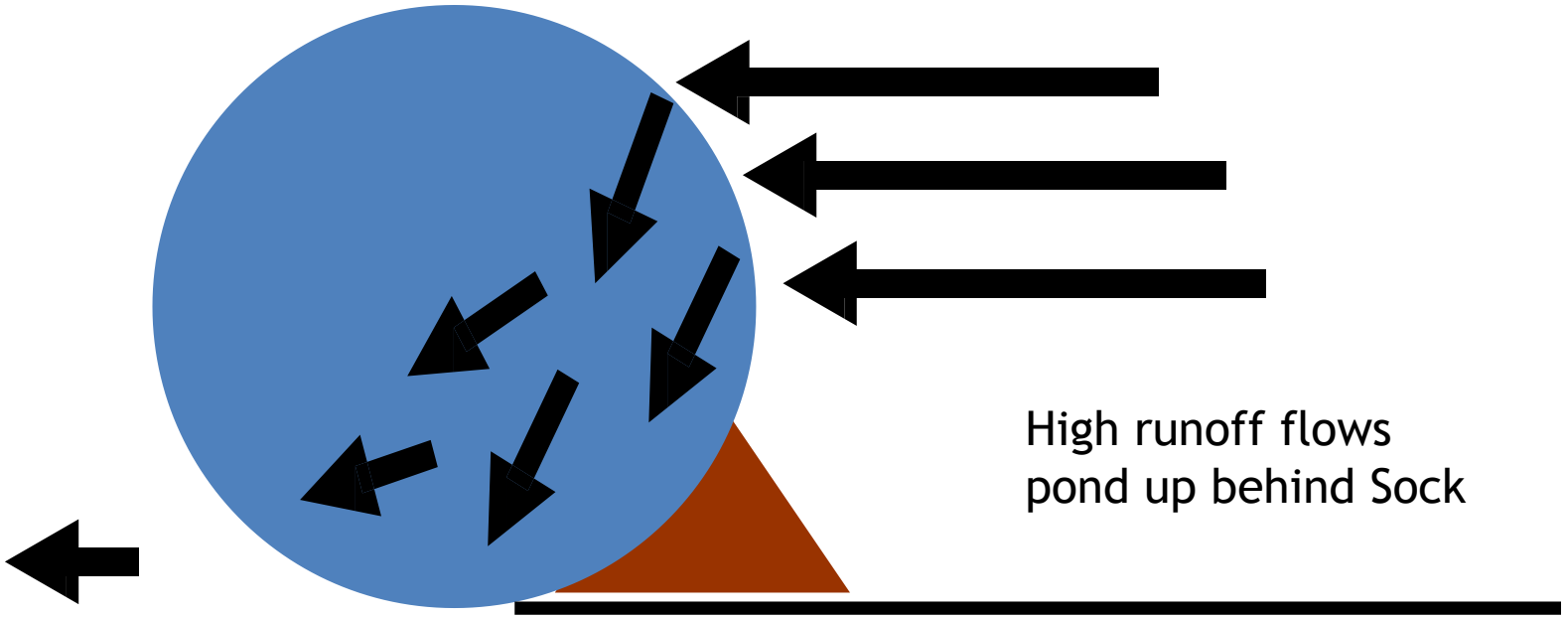
- Source: US EPA's Greenscapes Environmentally Beneficial Landscaping Program (2006)

Compost Filter Socks

- Several different kinds of compost socks, engineered for different purposes
- Many contain proprietary materials
- Coarse compost allows filtration



Compost Socks Don’t Fall Over & Can Be Used in Direct Flows



Compost Blanket & Filter Sock Application

The UNIVERSITY of VERMONT

January 2020

Ways to Source

- Contractors
  - Blower truck operators
  - More standard applications like slinger trucks

- Filter Sock distributors
  - Blower trucks can direct install
  - Companies like EJ Prescott sell palletized socks or Filtrexx distributors

Silt Fence Vs. Compost Products

- Have been in use for decades as sediment control practice for disturbed areas
- Mixed results – requires precise installation, maintenance & post-construction removal

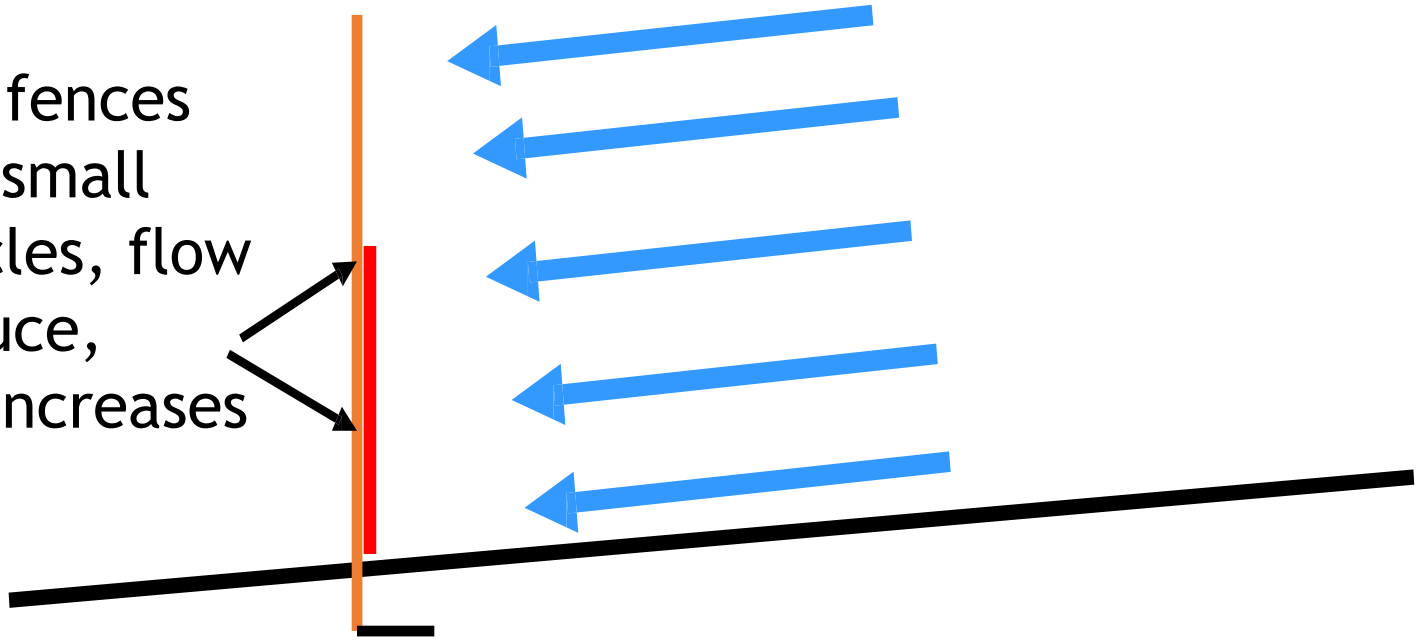
- Increasing in use as sediment control BMP
- Tested in multiple settings


Failed silt fence. Image cr: Filtrexx

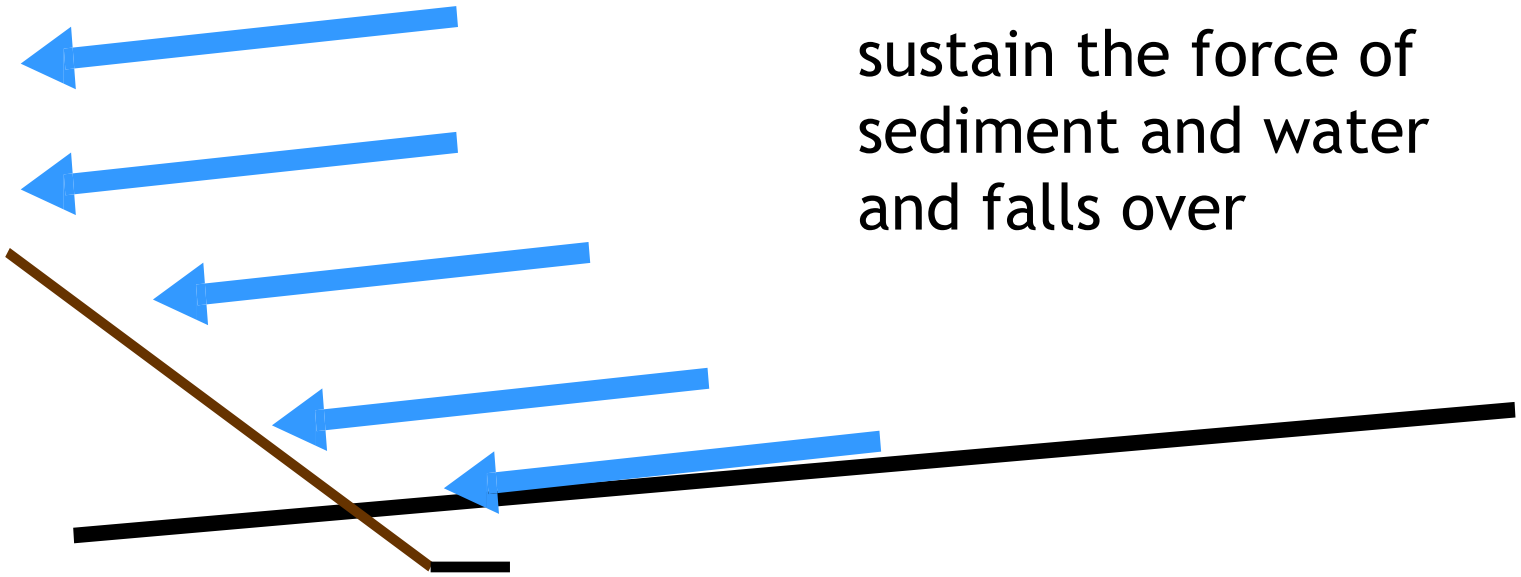
Eroded Sediments Knock Over Silt Fence

Silt Fences: Single Dimensional & A Problem When Clogged

When silt fences clog with small soil particles, flow rates reduce, ponding increases



The Number One Problem With Silt Fences (Besides Improper Installation)



Silt fence cannot sustain the force of sediment and water and falls over

Cost Estimates (2006): Filter Socks Vs. Silt Fences

	Filter Sock	**Silt Fence**
Materials (linear foot):	$3.00-3.50	$2.09-2.89
All-in Cost* (linear foot):	$7.68-8.18	$8.00-9.64

An 18-inch diameter sock used as a check dam ranges from $2.75 to $4.75 per linear foot.

*include materials and installation, inspection and sediment removal, repair and replacement, and fence removal and disposal cost

Timing of Application

- Most successful when planned for in design phase of a project
- Lead time for finding installers

Sourcing

- Erosion control businesses a good place to start

Tips and Tricks

- Get compost sample to verify it's the right coarseness
- Hydroseeding over compost may combine best of both worlds

Operation & Maintenance

- Location of compost availability drives a lot of the cost

Other Benefits of Filter Socks

- More natural solution
- Reduces chances of returning to site to fix wash outs
- Better at trapping soil particulate onsite to reduce run off
- Compost can be left and/or spread out after use

Detailed Resources

- Corey Poland – A comparison of DOT Erosion control blankets and specs

- Cal Trans – Improving Stormwater Quality with Compost Webinar 3:30hrs https://www.youtube.com/watch?v=CEZHnyEOQ8M

- Cornell's Compost Use for Improved Soil Poster Series https://ecommons.cornell.edu/handle/1813/45901

Best Management Practices for Low Nutrient Application

Low Nutrient Applications

- Compost can be used in applications around water bodies
- Analysis needed to demonstrate it's suitable for bio-retention or wetland applications

Phosphorous (P)

- Phosphorous is the nutrient of potential concern in compost
  - Composting reduces Carbon using Nitrogen
- Vermont has some designed testing around the Saturated Media method
- Penn State has a method derived from manure testing that focuses on water extractability which may be most useful for actual P measurement.

Low Nutrient Run Off Potential Compost

Low Nutrient Compost Specification

1. Soil Amendments – Compost

Compost is the product manufactured through the controlled aerobic, biological decomposition of biodegradable materials. The product has undergone mesophilic and thermophilic temperatures, which significantly reduces the viability of pathogens and weed seeds, and stabilizes the carbon such that it is beneficial to plant growth. Compost should meet or exceed all requirements to distribute in the state in which it is produced, as well as come from a facility that is registered and/or permitted by the appropriate state regulatory agency.

Required Ranges	Test	Test Method**	Units
< 3.00%	Total N	TMECC 04.02-D	% Dry Weight Basis
< 1.00%	Total P	TMECC 04.03-A	% Dry Weight Basis
6.5 to 8.0	pH	TMECC 04.11-A	pH
< 1.00	Soluble Salts	TMECC 04.10-A	dS/m (mmhos/cm)
20 - 65%	Moisture Content	TMECC 03.09-A	% Wet Weight Basis
20 - 55%	Organic Matter Content	TMECC 05.07-A	% Dry Weight Basis
Percent Emergence: > 90%	Maturity	TMECC 05.05-A	% Relative to Positive Control

Low Nutrient Run Off Potential Compost

Vigor:			
> 95%	Maturity	TMECC 05.05-A	% Relative to Positive Control
"Stable or Very Stable"	Stability	TMECC 05.08-B	mg CO2-C/g OM per day
> 80%	Particle Size^^	TMECC 02.02-B	% Dry Weight Basis
< 0.50%	Foreign Material	TMECC 03.08-A	% by Weight

Recommended Additional Test for Phosphorus Runoff Potential

≤ 800	Water Extractable Phosphorus	*See below+*	ppm, Dry Weight Basis

**All methods are from the Test Methods for the Evaluation of Compost and Composting (TMECC).

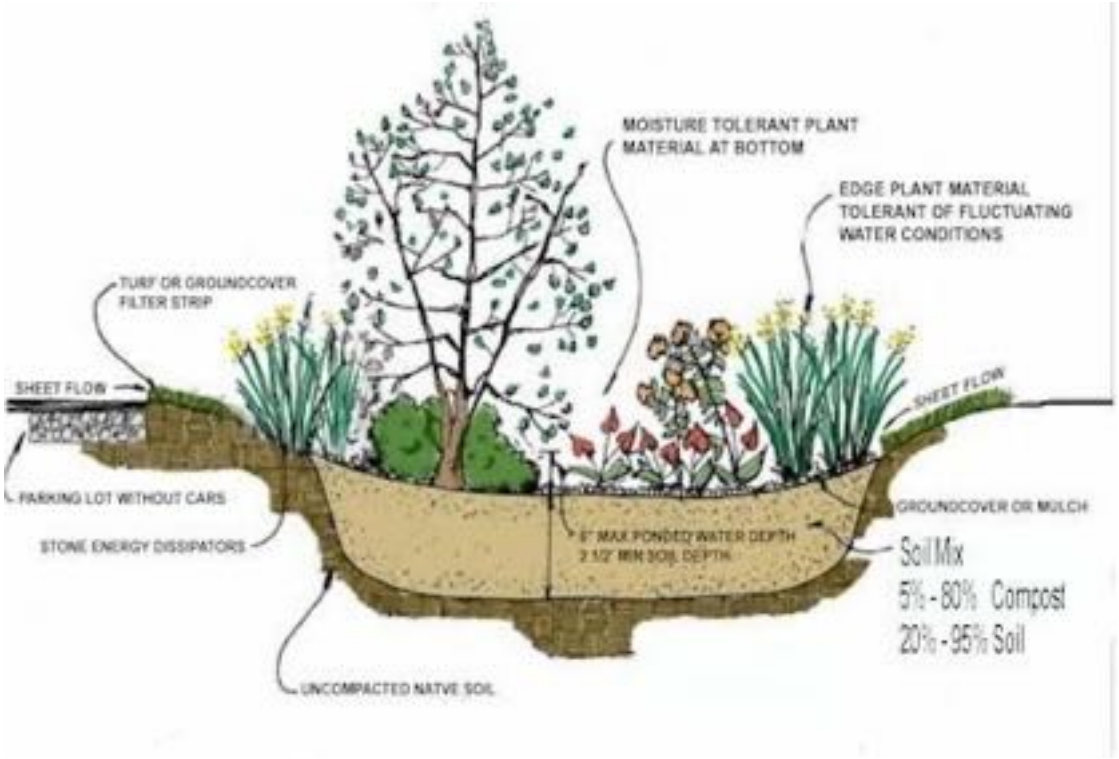
^^Particle size is based on passing a 9.5mm screen roughly 3/8" (95% plus passing is common).

+ As conducted by Pennsylvania State University Agricultural Analytics Laboratory
Per Water Extractable Phosphorus, 1:100 (solids:water) extraction. The reference method is, Kleinman, P., D. Sullivan, A. Wolf, R. Brandt, Z. Dou, H. Elliott, J. Kovar, A. Leytem, R. Maguire, P. Moore, L. Saporito, A. Sharpley, A. Shober, T. Sims, J. Toth, G. Toor, H. Zhang, T. Zhang. 2007. Selection of a water extractable phosphorus test for manures and biosolids as an indicator of runoff loss potential. J. Environ. Qual. 36: 1357-1367

Page 1 of 2 Continued...

Standard of Compost Quality:

Bioretention/Bioinfiltration/Rain Garden



How to install Low Nutrient Compost

- Bio-Retention soils or wetland mixes
  - Well-mixed and blended, or incorporated on site
  - Basis of design for a soil blend
  - Limit application rates
- Parts of this specification good for erosion control techniques around sensitive watersheds
  - Applied in limited fashion
- Since a testing-based verification recommended, recent, batch compost is critical

Sourcing Low Nutrient Compost/Compost Blends

- Test existing sources
  - Many more composts than you know may fit this spec
- Some composts, like manure-based compost, may not be a good fit
- Compost with larger amounts of carbon (wood) will be a good fit for these applications
- Unstable or partially composted materials are less suitable

Timing of Applications

- Testing takes time: plan a longer lead time for nutrient testing and assessment
- Very wet weather conditions are likely impede the quality of the installation and disturb too much soil
  - The goal is to reduce soil disturbance
  - Some places advocate soil placement in winter with frozen conditions, to reduce impacts

Operation & Maintenance

- No organic matter in bio-retention leads to long-term performance issues
- Sand or gravel based systems infiltrate or flow better at installation
- Future in-place nutrient testing is recommended
- Avoiding invasive species is critical
- Annual mowing or trimming is typically needed

Cost Comparisons

- Using compost can be a very cost effective option
- Compost versus Peat Moss
  - Peat in the NE is $100+ per cubic yard; not a renewable resource
  - Chemical or Complex Mechanical removal systems like stormfilter® / cartridge systems, costs $10,000's plus annual costs and waste (disposal off cartridges)

Amending a bio-retention basin in place

- Sandy soil to start with; only needed some OM

Tips and Tricks

- Avoid manure-based compost (manure as more then 25% of the starting compost)
- Woodier compost may be a better fit for this
- Penn State and U Maine offer options for Nutrient testing
- Larger compost businesses like Green Mountain Compost or Agresource may have more technical knowledge to support this testing at this time

Best Management Practices for Agricultural Applications

Composting Association of Vermont (CAV)

Reclaiming Organic Residuals For Good

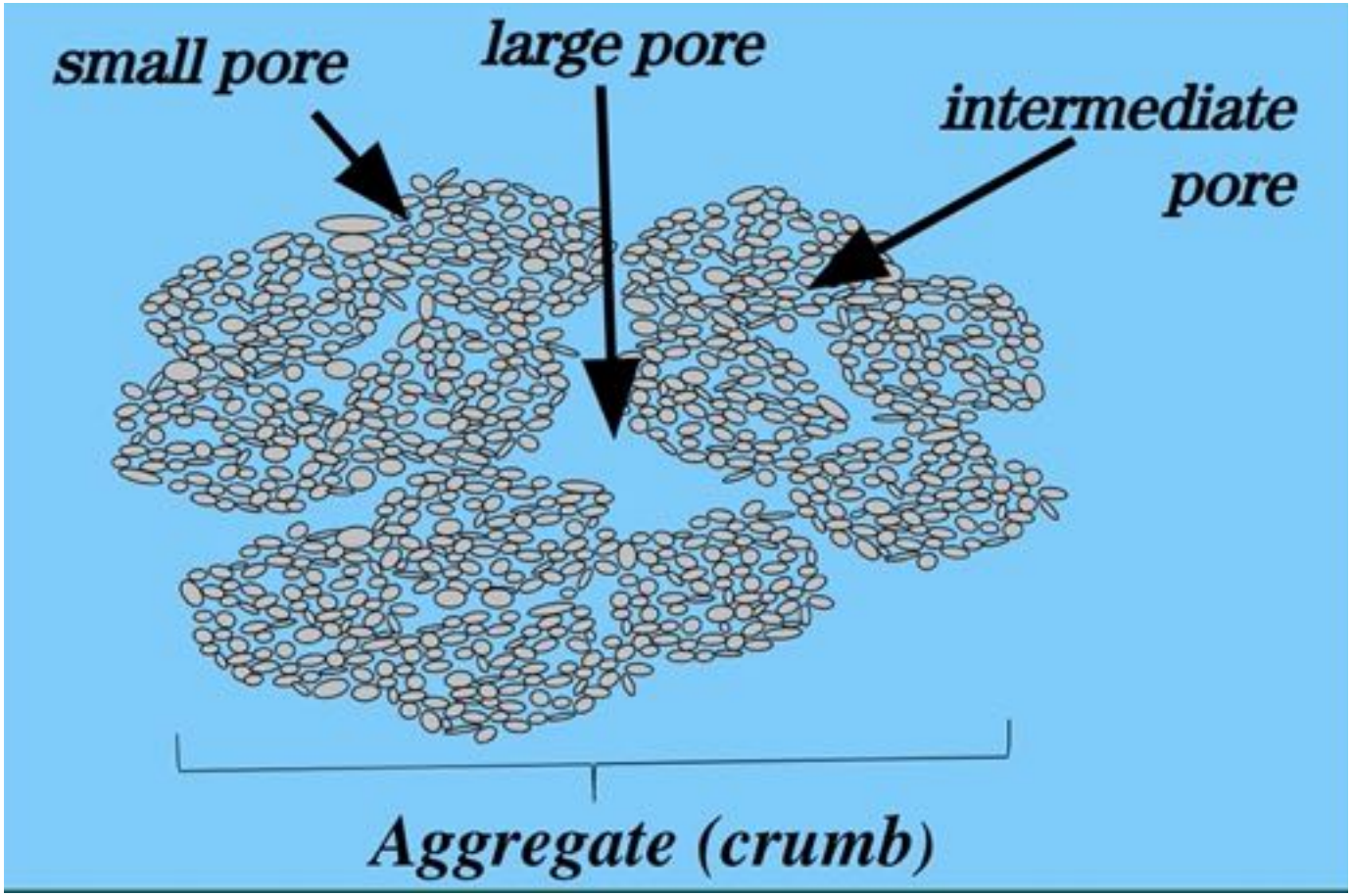
Compost in Agriculture

- Critical in “closing the loop”
- Specification as design is to reduce likelihood of inert contamination (plastic, glass, etc.)
- A standard for pathogens and heavy metals
- Finer particle compost:
  - Make blends
  - Improve field soils
  - Make mixes (potting, seed starting)
- Coarse fraction can be used for erosion control

Compost Supports Healthy Soil

- More air & better root growth – soil is “looser”
- Better water management – improved drought resistance & water storage
- Balanced diet for plants – increased nutrient retention/sustained release
- Fewer pests – biological resistance

Well Aggregated Soil = Range of Pore Sizes

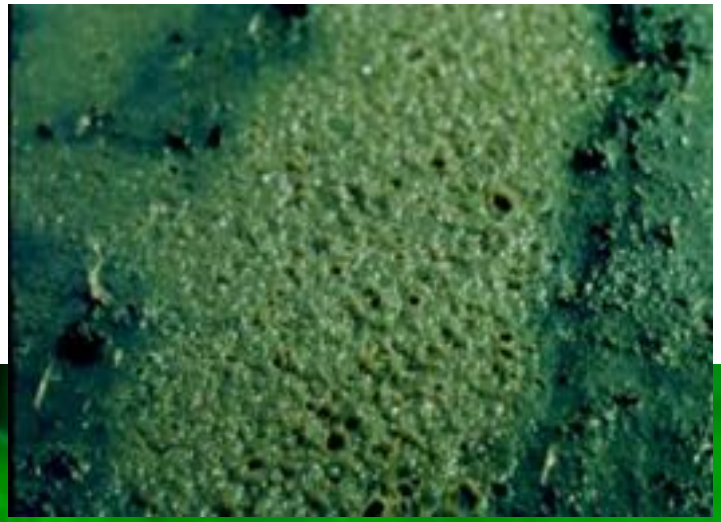


Impacts of Not Addressing Soil Quality

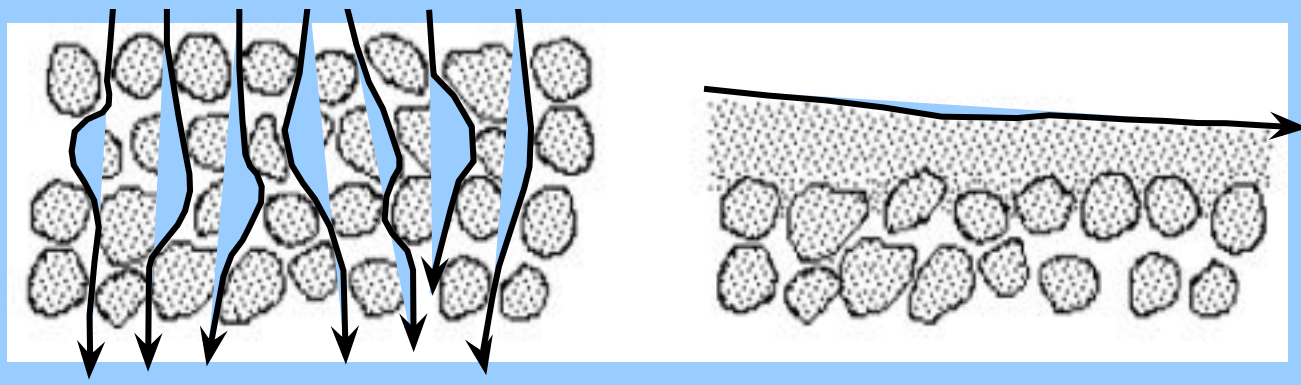
Cloddy soil after tillage/poor seedbed

Soil is packed & pulverized to make a fine seedbed

Raindrops disperse soil aggregates forming a surface crust



Runoff Over Crusted Soil Leads to Erosion



a) aggregated soil

b) soil crusts after aggregates break down

Soil Moisture Benefits

- Each increase of 1% OM can increase soil WHC by 16,500 gallons of water per acre (NRCS)
- More water soaks in, less water flows over, soil erosion is reduced
- Increased soil water = greater drought tolerance
- Reduced evaporation from soils reduces irrigation demands

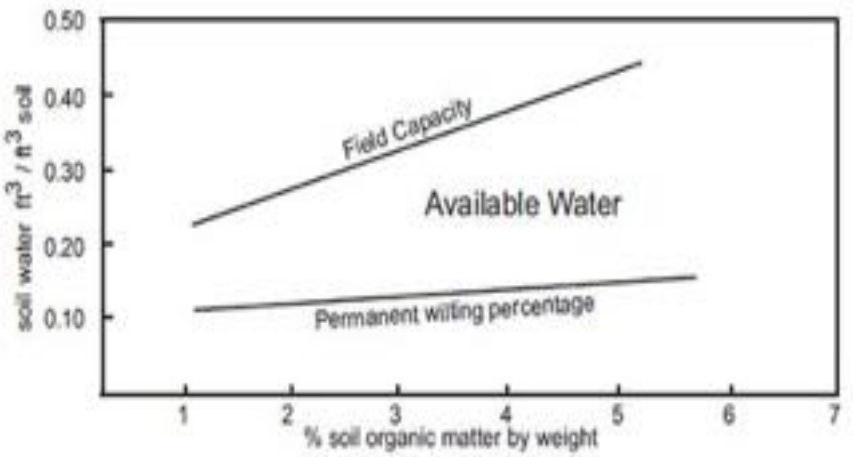


Figure 2. Effect of increasing organic matter on available water capacity of silt loam soils. Adapted from Hudson, SWCS, 1994.

Sally Brown BioCycle March/April 2014

Agriculture Use Specification

Physical/Chemical Requirements Property Test Method Requirements for Compost Specifications

Required Ranges	Test	Test Method**	Units
6.0 to 7.5	pH	TMECC 04.11-A	pH
< 4.00	Soluble Salts	TMECC 04.10-A	dS/m (mmhos/cm)
20 - 55%	Moisture Content	TMECC 03.09-A	% Wet Weight Basis
25 - 75%	Organic Matter Content	TMECC 05.07-A	% Dry Weight Basis
Percent Emergence: > 100%	Maturity	TMECC 05.05-A	% Relative to Positive Control
Vigor: > 100%	Maturity	TMECC 05.05-A	% Relative to Positive Control
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> 80%	Particle Size^^	TMECC 02.02-B	% Dry Weight Basis
< 0.25 %	Foreign Material	TMECC 03.08-A	% by Weight

**All methods are from the Test Methods for the Evaluation of Compost and Composting (TMECC).

^^ Particle size is based on passing a 9.5 mm screen roughly 3/8" 95% plus passing is common

Standard of Compost Quality:

Applications in Agriculture

- Delivery can vary to meet project needs
  - Even bagged or super sacks (1.5 yard crane bags)
- Side dressing can be done with existing crops
  - Like trees or corn (row crops)
- Can use compost made from a wide variety of feedstocks (food scraps, manures, etc.)

New York Commercial Scale Demo

Dusty But Possible With Standard Manure Spreader

Nursery Uses in Ground Backfill

Additional Compost BMPs for Farms

- Compost berms and socks
  - Edges of fields
  - Check dams in drainage ways
  - Seeded, to establish vegetated buffers

Image credits: Top and Middle - Extension Foundation (campus.extension.org); Bottom - Cape Atlantic Conservation District, NJ (capeatlantic.org)

Ways to Source

- Compost: a bulk commodity product
- Local producers = more affordable
- On-farm composting

Source-separated food scraps delivered to Tamarlane Farm from grocery stores, schools and other locations

- March 2021

Cost Comparisons

- Hard to compare directly to NPK in commercial fertilizers
- Compost provides nutrients - and so much more:
  - Robust soil amendment
  - Organic matter
  - Beneficial microbes
  - Environment for healthy web
  - Support for healthy plant/root development
  - Multiple ecosystem services

Photo from naturalnews.com

Compost - Part of Larger System to Reduce Erosion & Runoff From Fields

- Soil cover: protect soil from compaction, direct rainfall impact
- Timing, technique, rates of application
- Reduced tillage
- Cover cropping
- Crop rotation

Image from Phys.org

Changing Our Way of Thinking

- Impact of changing climate (larger rain events mixed with extended drought conditions)
- Urgent need to rethink landscape management practices
- Compliance mindset → restoration/regenerative mindset

Soil Builders Webinars & Resources

CompostingVermont.org/Soil-Builders

Education in Action

The Soil Builders workshops were developed to provide compost-related eco-literacy for Lake Champlain Basin decision-makers, professionals and advocates.

Concerns about elevated phosphorous levels in the Lake Champlain Basin have contributed to confusion about when and how to use compost. There's a knowledge gap about specific benefits from using compost and how to modify current farming, site engineering and landscaping practices to produce those benefits.

The different Soil Builders modules will help you:

- Gain a deeper understanding of the connections between soil health & water quality
- Understand some of the drivers for building healthy soil and increasing water quality
- Increase your technical know-how about compost, including specific compost Best Management Practices for a wide range of interventions
- Learn how to support change of practice for road construction, development projects, stormwater control & site remediation

Project Partners:

- Athena Lee Bradley, Compost Consultant, CAV Board Member
- Mark Companion, Lake Champlain Sea Grant
- Chuck Duprey, Naturcycle
- Brian Jerose, Agrilab Technologies Inc., CAV Board Member
- Deb Neher, UVM
- Elly Ventura, Lamoille Regional Solid Waste Management District, CAV Board Member

This project has been funded wholly or in part by the United States Environmental Protection Agency under assistance agreement (LC00A00605) to New England Interstate Water Pollution Control Commission in partnership with the Lake Champlain Basin Program.

Lake Champlain Basin Program

NE IW PCC

Contact Information

Natasha Duarte, Director

Composting Association of Vermont

natasha@compostingvermont.org

802-373-6499

compostingvermont.org

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