Compost Use in Green Infrastructure

Growing Green Infrastructure in New York

November 17, 2011

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Outline

1. Who is WeCare Organics?
2. What is Compost?
3. Green Infrastructure Components
   * Green Roofing
   * Engineered Soils
   * Erosion Control

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Who is WeCare Organics?

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WeCare Organics

* Headquartered outside of Syracuse, New York
* Four main operating groups
  - WeCare Facilities Operations Group (WFOG)
  - WeCare Product Marketing Group (WPMG)
  - WeCare Technology Group (WTG)
  - WeCare Residual Services Group (WRSG)
* Currently manage ~20 organic waste sites/facilities and service many others
* Sister companies include
  - WeCare Transportation

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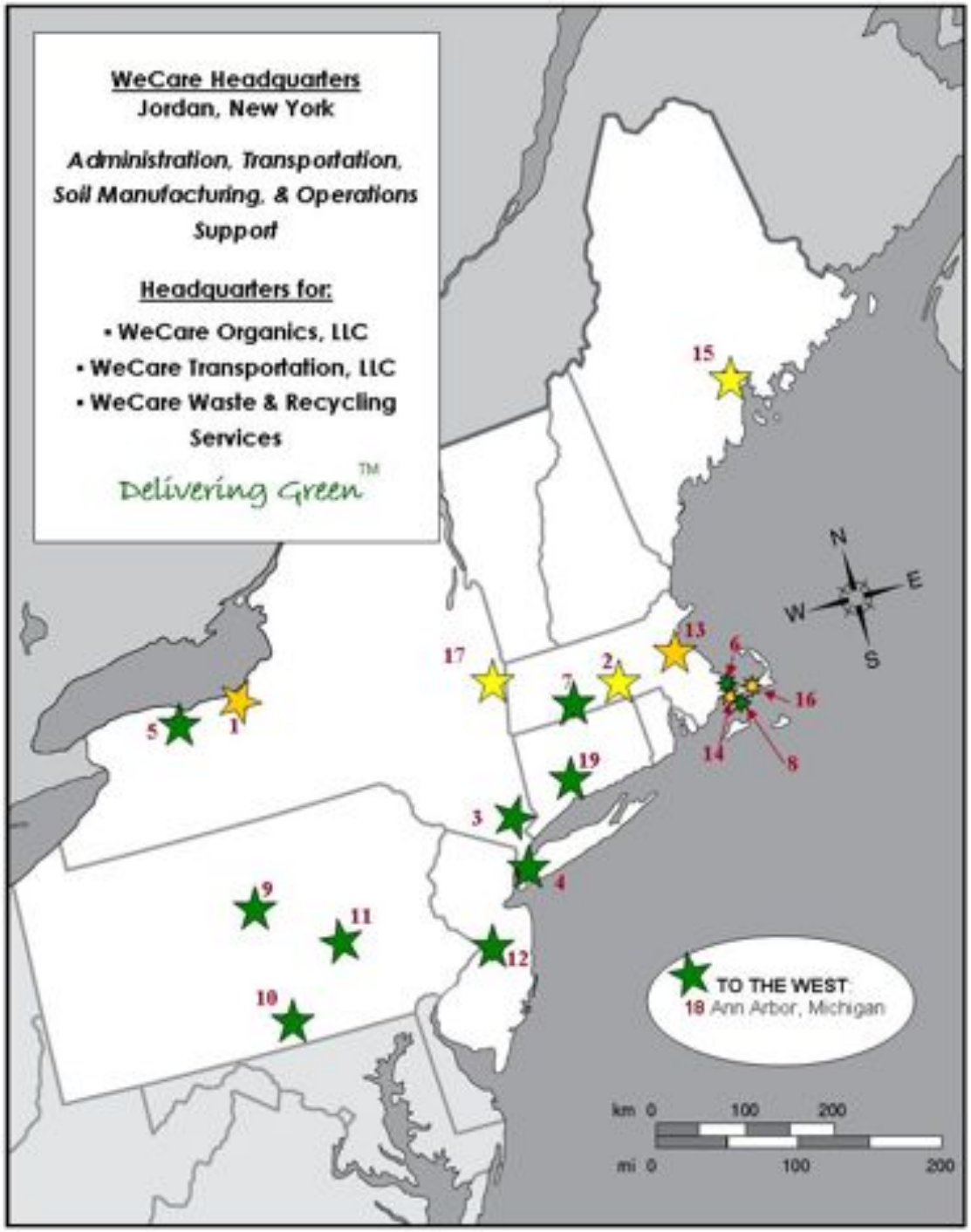
WeCare Headquarters
Jordan, New York
Administration, Transportation, Soil Manufacturing, & Operations Support
Headquarters for:
• WeCare Organics, LLC
• WeCare Transportation, LLC
• WeCare Waste & Recycling Services
Delivering Green™
TO THE WEST
18 Ann Arbor, Michigan
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What is Compost?

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Definition

"Compost" is the product from the controlled biologic decomposition of organic material that has been sanitized through the generation of heat and stabilized to a point that it is beneficial to plant growth.

Compost is produced through the activity of aerobic microorganisms. These microbes require oxygen, moisture, and food in order to grow and multiply. When these resources are maintained at optimal levels, the natural decomposition process is greatly accelerated.

From "Field Guide to Compost Use", USCC 1996

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Why Compost?

1. Reductions in soil quality
2. Poor soil protection & management practices
3. Increased soil erosion
4. Storm water management requirements
5. Protection of surface & ground water quality
6. Climate change
7. Pollutant management & remediation
8. Improved plant growth / less loss
9. Reduction of plant maintenance inputs
10. Effective & economic

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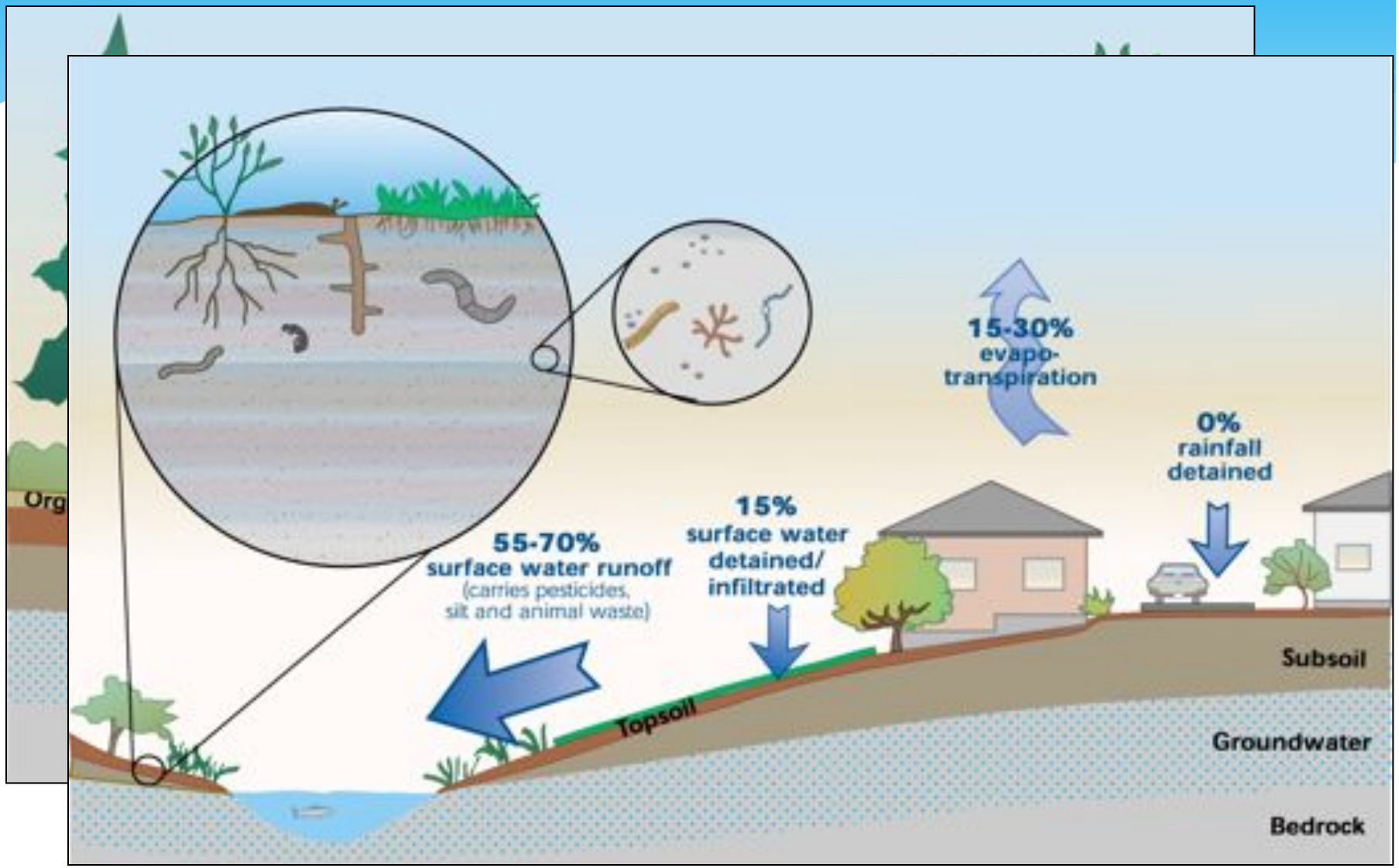
Urbanization and Soil Loss



Common Feedstocks

* Biosolids
* Animal manures
* Yard waste, wood & wood by-products
* Pre & post consumer food waste
* Industrial by-products
* Various organic by-products

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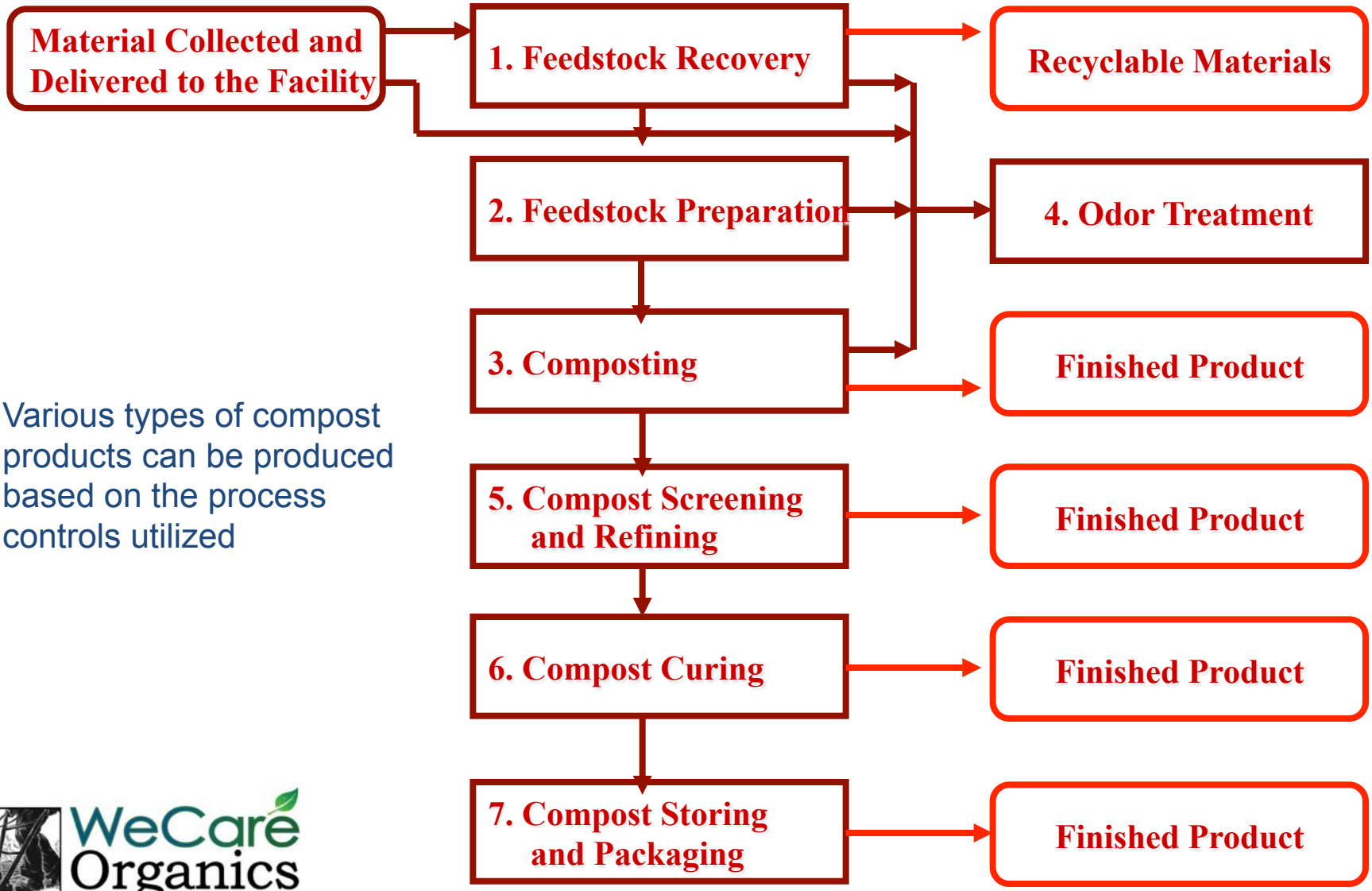
Composting Process



Various types of compost products can be produced based on the process controls utilized

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Compost Operations

Compost Methods

1. Turned Windrows
2. Passive Aerated Windrows
3. Aerated Static Pile
4. In-vessel Composting

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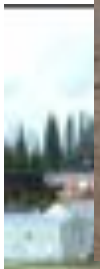


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Benefits of Compost

Physical:
- Improved structure
- Moisture management

Chemical:
- Modifies and stabilizes pH
- Increases CEC
- Provides nutrients

Biological:
- Provides soil biota
- Suppresses plant diseases

Other:
- Binds/degrades contaminants
- Binds nutrients
- Sequester Air-Borne Carbon

Compost Quality Factors

* Analytical Parameters
* Stability vs. Maturity
* Pathogens and Vectors
* Presence of undesirable components
  - Man-made inerts, weed seeds, heavy metals, phytotoxic compounds
* Uniformity from batch to batch
* Raw materials used
* Quality and Use of compost closely linked

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Analyzing Compost Quality

* Test Methods for Examination of Composting and Composts (TMECC)
* Commercial laboratories
* State services (Ag departments)
* US Composting Council Seal of Testing Assurance (STA) Program
  - Compost testing and information disclosure program (costumer confidence)
  - Sets testing parameters and frequency
  - STA certified labs

US Composting Council
Seal of Testing Assurance®

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Account No.:
1080698 - 1/1 - 310
Group: Aug.11 D No. 13

Date Received 25 Aug. 11
Sample I.d. August 2011 - Burlington County NJ Compost
Sample I.d. No. 1/1 1080698

INTERPRETATION:

AgIndex (Nutrients/Na+Cl)

15 High nutrient ratio Composts with low AgIndex values have high concentrations of sodium and/or chloride compared to nutrients. Repeated use of a compost with a low AgIndex (< 2) may result in sodium and/or chloride acting as the limiting factor compared to nutrients, governing application rates. These composts may be used on well-draining soils and/or with salt-tolerant plants. Additional nutrients form another source may be needed if the application rate is limited by sodium or chloride. If the AgIndex is above 10, nutrients optimal for plant growth will be available without concern of sodium and/or chloride toxicity. Composts with an AgIndex of above 10 are good for increasing nutrient levels for all soils. Most composts score between 2 and 10. Concentrations of nutrients, sodium, and chloride in the receiving soil should be considered when determining compost application rates. The AgIndex is a product of feedstock quality. Feedstock from dairy manure, marine waste, industrial wastes, and halophytic plants are likely to produce a finished compost with a low AgIndex.

Plant Available Nitrogen (lbs/ton)

23 High N Provider Plant Available Nitrogen (PAN) is calculated by estimating the release rate of Nitrogen from the organic fraction of the compost. This estimate is based on information gathered from the BAC test and measured ammonia and nitrate values. Despite the PAN value of the compost, additional sources of Nitrogen may be needed during he growing season to off-set the Nitrogen demand of the microbes present in the compost. With ample nutrients these microbes can further breakdown organic matter in the compost and release bound Nitrogen. Nitrogen demand based on a high C/N ratio is not considered in the PAN calculation because additional Nitrogen should always be supplemented to the receiving soil when composts with a high C/N ratio are applied.

C/N Ratio

13 Indicates maturity As a guiding principal, a C/N ratio below 14 indicates maturity and above 14 indicates immaturity, however, there are many exceptions. Large woodchips (>6.3mm), bark, and redwood are slow to breakdown and therefore can result in a relatively stable product while the C/N ratio value is high. Additionally, some composts with chicken manure and/or green grass feedstocks can start with a C/N ratio below 15 and are very unstable. A C/N ratio below 10 supplies Nitrogen, while a ratio above 20 can deplete Nitrogen from the soil. The rate at which Nitrogen will be released or used by the microbes is indicated by the respiration rate (BAC). If the respiration rate is too high the transfer of Nitrogen will not be controllable.

Soluble Nutrients & Salts (EC5 w/w dw - mmhos/cm)

6.0 Average salts This value refers to all soluble ions including nutrients, sodium, chloride and some soluble organic compounds. The concentration of salts will change due to the release of salts from the organic matter as it degrades, volatilization of ammonia, decomposition of soluble organics, and conversion of molecular structure. High salts + high AgIndex is indicative of a compost high in readily available nutrients. The application rate of these composts should be limited by the optimum nutrient value based on soil analysis of the receiving soil. High Salts + low AgIndex is indicative of a compost low in nutrients with high concentrations of sodium and/or chloride. Limit the application rate according to the toxicity level of thesodium and/or chloride. Low salts indicates that the compost can be applied without risking salt toxicity, is likely a good source of organic matter, and that nutrients will release slowly over time.

Lime Content (lbs. per ton)

0 Low lime content Compost high in lime or carbonates are often those produced from chicken manure (layers) ash materials, and lime products. These are excellent products to use on a receiving soil where lime has been recommended by soil analysis to raise the pH. Composts with a high lime content should be closely considered for pH requirements when formulating potting mixes.

Physical Properties

Percent Ash

23.9 Low ash content Ash is the non-organic fraction of a compost. Most composts contain approximately 50% ash (dry weight basis). Compost can be high in ash content for many reasons including: excess mineritization(old compost), contamination with soil base material during turning, poor quality feedstock, and soil or mineral products added. Finding the source and reducing high ash content is often the fastest means to increasing nutrient quality of a compost.

Particle Size % > 6.3 MM (0.25")

8.2 May restrict use Large particles may restrict use for potting soils, golf course topdressings, seed-starter mixes, and where a fine size distribution is required. Composts with large particles can still be used as excellent additions to field soils, shrub mixes and mulches.

Particle Size Distribution

Each size fraction is measured by weight, volume and bulk density. These results are particularly relevent with decisions to screen or not, and if screening, which size screen to use. The bulk density indicates if the fraction screened is made of light weight organic material or heavy mineral material. Removing large mineral material can greatly improve compost quality by increasing nutrient and organic concentrations.

Appendix:

Plant Available Nitrogen (PAN) calculations:
PAN = (X * (organic N)) + ((NH4-N) + (NO3-N))
X value = If BAC < 2 then X = 0.1
If BAC =2.1 to 5 then X = 0.2
If BAC =5.1 to 10 then X = 0.3
If BAC > 10 then X = 0.4
Note: If C/N ratio > 15 additional N should be applied.

Estimated available nutrients for use when calculating application rates	lbs/ton
Plant Available Nitrogen (PAN)	23.3
Ammonia (NH4-N)	5.60
Nitrate (NO3-N)	0.01
Available Phosphorus (P2O5*0.64)	32.0
Available Potassium (K2O)	6.7

rganic matter in the sample (as received).
s released under optimized moisture and

rh CO2 is released under optimized moisture, temperature, BAC test values are close to the same value, the pile is eeds more time. If both values are low the compost has r than 8/8 indicate that the compost pile has stalled. This cessive air converting ammonia to the unavailable nitrate pH value out of range, or microbes rendered non-active.

ur at such a rapid rate that sometimes phytotoxins remain in fore using in high concentrations or in high-end uses. This is in excess with the break-down of organic materials resulting sults in a loss of volatile ammonia (it smells). Once this toxic drops, the microbes convert the ammonia to nitrates. A low e of a mature compost, however there are many exceptions. (?) will retain ammonia, while a compost with high lime content otion becomes stable. Composts must first be stable before

use they are salt tolerant and very sensitive to ammonia can germinate seeds in high concentrations of compost to Values above 80% for both percent emergence and h salts that affect the cucumbers, excessive concentrations ke a growing media. In addition to testing a 1:1 compost: sitive toxicity level.

ic and anaerobic conditions and is common in all initial al matter is loaded in fecal coliforms. Therefore fecal pathogen reduction (heat for compost) has met the rms are reduced to below 1000 per gram dry wt. it is f fecal coliform can regrow during the curing phase or r growth than during the composting process.

rganism but also a toxic microbe. It has been used in the

33 regulations are chosen to determine if compost ncentrations of heavy metals are derived from moldton wood. Biosolids are rarely a problem.

Potassium. Reported units are consistent with those mpost with high nutrient content, and best used to supply and is best-used to improve soil structure via the

Green Infrastructure Components

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Green Roofing

* Very high quality compost, no room for error!
  - No weeds
  - Proper growth and stability
* Becoming very regionalized
* Material specification needs to fit:
  - Building structure
  - Intended use
  - Longevity and minimal maintenance

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AXA EQUITABLE

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Engineered Soils

* Testing and QA/QC
* Multi Faceted Coordination
  - Landscape Architects
  - Soil Scientists
  - Engineers
  - General Contractors
  - Client
* Keep it local!
* Uses for Stormwater Management
  - Rain Gardens
  - Engineered Wetlands
  - Bio-swales

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Rain Garden

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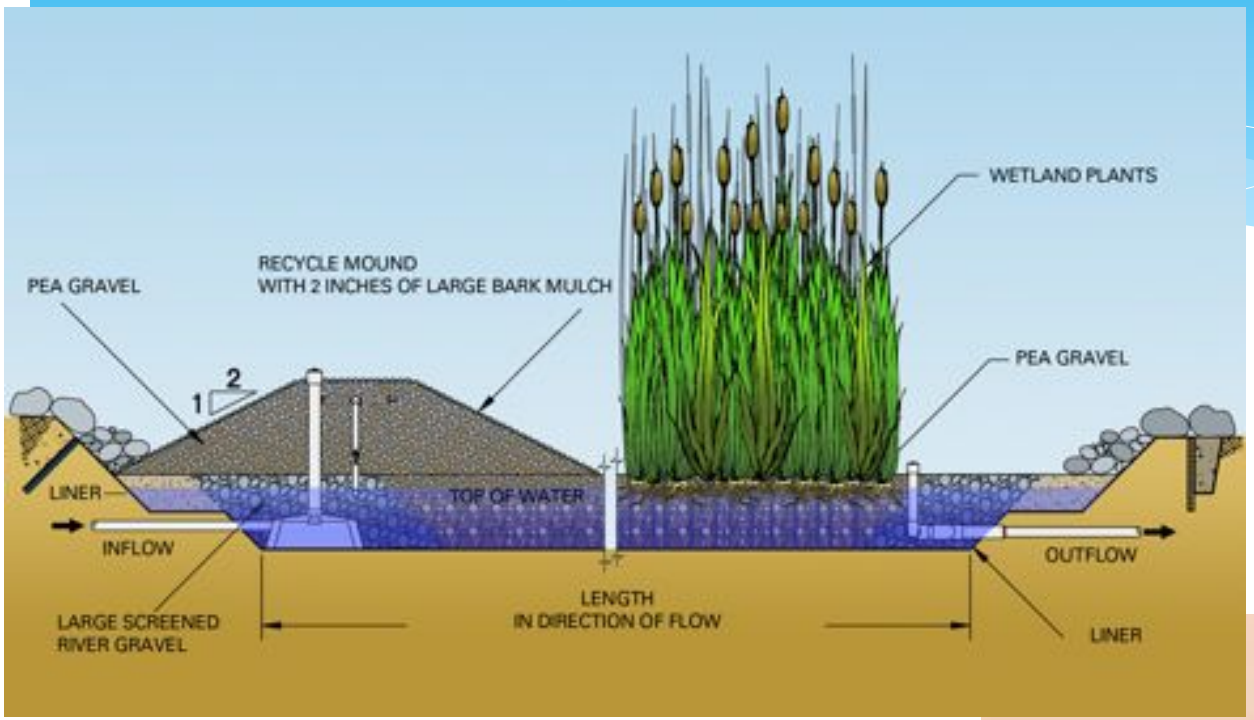
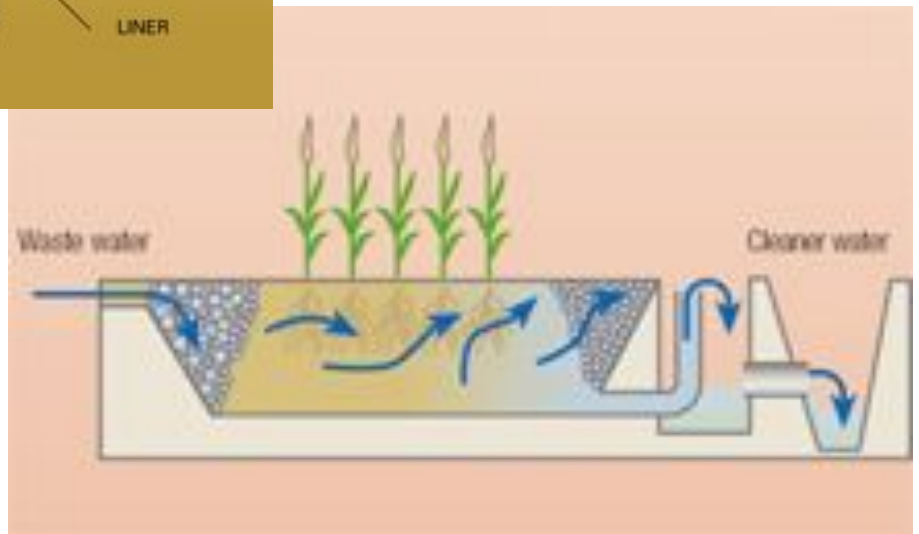
Engineered Wetlands





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Engineered Wetlands

Engineered Wetlands

Bio-swale

Bio-swale

Erosion Control

* Used for construction/ development projects
* Very productive and efficient
* Water treatment capabilities
* Needs to be specified properly
* Use (re-use) and application
* Control Measures
  - Compost Socks
  - Compost Blankets
  - Compost Berms

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Compost Socks

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Compost Socks

Compost Blankets

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Compost Berms

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Wrap Up

* Understand Compost Generation
* Not all composts are equal
* Quality, Quality, Quality!
* Bridge gaps between all players
* Regionalization of materials
* Follow proper applications
* Need specifications for ALL these uses
* Stand behind product and service

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Questions?

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