VRA Markets Panel 2016

Compost, Soils and Water Management
How does compost benefit soils?

- Improves moisture retention
- Promotes plant establishment,
- Suppresses soil-borne diseases, reducing the need for pesticides,
- Reduces the need for fertilizers,
- Prevents erosion, and
- Safeguards water quality.
Soil Moisture Characteristics

Saturation: No air available, plants die

Field Capacity: Ideal growing conditions

Permanent Wilting Point: No water available, plants die
Water retention in soil

- Saturated (0 kPa*): Water is freely available and can be easily extracted.
- Field capacity (-30 kPa): Water is held by the soil in a readily available form.
- Wilting point (-1500 kPa): Water is held at a point where plant roots can no longer extract it.

* kPa = kilopascal; atmospheric pressure = 101.3 kPa
Available Water vs. Organic Matter

- Soil organic matter ~ 58% carbon
- Soil carbon increases by 4x, plant available water increases by 2.2 to 2.5x

Water savings from compost/mulch (agriculture & landscaping)

Table 1. Water savings by application type from water literature review.

<table>
<thead>
<tr>
<th>Type</th>
<th>No. Studies</th>
<th>Average minimum water savings</th>
<th>Average maximum water savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compost (Quantitative)</td>
<td>28</td>
<td>26%</td>
<td>34%</td>
</tr>
<tr>
<td>Compost (Qualitative)</td>
<td>19</td>
<td>All showed increase</td>
<td>All showed increase</td>
</tr>
<tr>
<td>Compost/Mulch (Quantitative)</td>
<td>1</td>
<td>15%</td>
<td>64%</td>
</tr>
<tr>
<td>Compost/Mulch (Qualitative)</td>
<td>1</td>
<td>All showed increase</td>
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<tr>
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<td>27</td>
<td>All showed increase</td>
<td>All showed increase</td>
</tr>
<tr>
<td>Total</td>
<td>104</td>
<td>20%</td>
<td>46%</td>
</tr>
</tbody>
</table>

Source: Association of Compost Producers, CA (2016)
How do these soil conditions affect storm water runoff?

- If soil is saturated – all runs off
- If soil is at field capacity – some absorbed
- If soil is at wilting point – depends
  - Depends on retention time to allow infiltration
  - Short retention time – high runoff
  - Long retention time – high infiltration (up to saturation)
Benefits of compost on storm runoff

- Reduces the amount of runoff draining from a property
- Increases the space between soil particles to allow infiltration of runoff, thereby promoting groundwater recharge
- Studies have shown a 65% increase in soil moisture storage capacity through practicing soil amendments
- Filters out stormwater pollutants through sorption, precipitation, filtering, and bacteriological and chemical degradation
- Reduces erosion and sedimentation
- Reverses the negative impacts of soil compaction due to development
Virginia in the Chesapeake Bay

- 15.3 million acres (56% of the Commonwealth area)
- 6 million residents (75% of the Commonwealth population)
- 1.2 million acres of turfgrass in watershed
Bay-Wise Landscapes

<table>
<thead>
<tr>
<th>Sparse</th>
<th>Plant vigor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Infiltration Rate</td>
</tr>
<tr>
<td>Limited</td>
<td>Plant Available water</td>
</tr>
<tr>
<td>High</td>
<td>Bulk Density</td>
</tr>
<tr>
<td>Low</td>
<td>Organic Matter</td>
</tr>
<tr>
<td>Limited</td>
<td>Plant avail. nutrients</td>
</tr>
<tr>
<td>Shallow</td>
<td>Abundant, organic</td>
</tr>
<tr>
<td>Low</td>
<td>Root depth / density</td>
</tr>
<tr>
<td></td>
<td>Deep, dense</td>
</tr>
<tr>
<td></td>
<td>Bacterial / Fungal Activity</td>
</tr>
<tr>
<td></td>
<td>High / Active</td>
</tr>
</tbody>
</table>

Source: Schwartz, UMBC (2016)
Suburban Subsoiling

- Deep ripping
- Compost amendment

Source: Schwartz, UMBC (2016)
Summary

- Compost-amended soils shown to reduce water demand in irrigated agriculture and landscaping.
- Compost-amended soils shown to reduce storm water runoff due to higher infiltration rates and water-holding capacities.
- Suburban subsoiling techniques offer significant improvements to compacted urban soils.
  - Improved water-holding capacities.
- Reduced runoff volumes shown to improve runoff water quality mass loadings to waterbodies.
Questions?

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