Bio-Reactive Cover Systems
--Research Review and Plans--
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BIOCOVER STUDY AREA

4 collars in one Control square

Compost over treated squares (15” deep) and buffer area
Methane Flux median values

Flux (g/m²/d)

Date

Control
Compost
First Tentative Conclusion

We need to compare compost treatment with a landfill cover area that is emitting larger amounts of methane.

Follow-on Research

The new area (Site-4) has only temporary cover over 2-year old trash. Site-4 median flux is 3.4 g/m^2/d (May), compared to 0 flux for current control site.
Map of Leon County Landfill, Phase IIb and IIC showing the three Sites, Grid 1, Site-4 Grid, and ages of the most recent waste.
Second Tentative Conclusion

Compost treatment results in nearly complete elimination of methane flux

Follow-on Research Questions

Is compost better than an equal depth of soil?

How does the depth of compost affect flux?
Gas Profiles in Control and Compost

**Control 2B**

- **CO2**: Dark blue line
- **O2**: Pink line
- **N2**: Yellow line
- **CH4**: Light blue line

**Compost Treatment 2D**

- **CO2**: Dark blue line
- **O2**: Pink line
- **N2**: Yellow line
- **CH4**: Light blue line
Gas Profiles in Source and Compost Treatment

Compost-Source Pile

Compost Treatment 2D
Range of Gas Profiles in Compost

Compost Treatment 2D

- CO2
- O2
- N2
- CH4

% composition

depth (cm)

Compost Treatment 6D

- CO2
- O2
- N2
- CH4

% composition

depth (cm)
Water Content and Porosity

Volumetric Water Content (g/cm³)

<table>
<thead>
<tr>
<th>Control Squares</th>
<th>Compost Squares</th>
</tr>
</thead>
<tbody>
<tr>
<td>2B 0.076</td>
<td>2D 0.442</td>
</tr>
<tr>
<td>4B 0.095</td>
<td>4D 0.410</td>
</tr>
<tr>
<td>8B 0.093</td>
<td>6D 0.329</td>
</tr>
</tbody>
</table>

Gas-filled Porosity

(assuming topsoil 2.65 g/cm³, compost 1.9 g/cm³)

<table>
<thead>
<tr>
<th>Control Squares</th>
<th>Compost Squares</th>
</tr>
</thead>
<tbody>
<tr>
<td>2B 0.393</td>
<td>2D 0.005</td>
</tr>
<tr>
<td>4B 0.305</td>
<td>4D 0.061</td>
</tr>
<tr>
<td>8B 0.239</td>
<td>6D 0.099</td>
</tr>
</tbody>
</table>

Water (g) / Soil Volume (cm³)

Gas (cm³) / Soil Volume (cm³)
Methane Flux for May 18
median values

Flux (g/m²/d)

Control Squares

2B: 0.808
4B: -0.045
8B: -0.012

Compost Squares

2D: 2.052
4D: 0.630
6D: 0.015
Possible Solutions to Wet, Compacted Compost

• Rototill
• Plant Transpiration
• Use coarse mulch (in future biocovers)
Third Tentative Conclusion

Moist, fine-textured compost has very little gas-filled porosity when spread with a dozer. If roots do not extract rainfall pores fill with water. This results in poor conditions for methane oxidation.

Follow-on Research Question

Will freshly chipped mulch give better porosity and deeper oxygen penetration?
Effect of Wet Soil on Gas Flux

Vent tubes remain after water recedes
Fourth Tentative Conclusion

There appears to be enhanced gas flux through vents in wet soil

Follow-on Research Question

Will a low area that collects runoff and stays wetter have greater methane flux?
## Experimental Treatments
### New “Site-4” Area

<table>
<thead>
<tr>
<th>Soil</th>
<th>Soil + Mulch</th>
<th>Crushed Glass + Thick Mulch</th>
<th>Crushed Glass + Thin Mulch</th>
<th>No Additional Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No Additional Cover (Low Area)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Haul Road

N

Diagram showing different treatments and their configurations.
Expected Benefits from Proposed Study

- Site-4 appears to have enough methane flux to test for significant differences between treatments.
- Methane flux from mulch and soil treatments will be compared.
- Flux from two depths of mulch will be compared.
- Freshly chipped mulch will be used instead of aged compost to improve oxygen penetration.
- Flux from wet soil will be compared to drier areas.