Improving Soil Health with Bloom Soil Conditioner

Rooting DC 2018

District of Columbia Water And Sewer Authority
Bill Brower, Manager, Resource Recovery
Urban soils are typically poor

- Low in nutrients (macro & micro)
- Low in organic matter
- pH issues
- Compacted
- Poor drainage
- Disturbed soil profile (excavation, addition of fill)
- Some have elevated levels of pollutants, trash, construction debris
How to improve veggie garden soil

1. Test your soil—fertility (~$40, every few years) and lead/cadmium/barium (~$50, when starting), etc.
   a) UDC, PSU, Waypoint, etc.

2. Interpret the results
   a) Fertility
   b) Contaminants (EPA Resident Soil Regional Screening Levels)

3. Choose soil approach
   a) Contaminated: Lined, raised beds with imported soil
   b) Clean but deficient: Amend existing soil
## Example Soil Test Result

| Sample/Field Number: 1B |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Estimated Soil Texture | Organic Matter % | Soluble Salts mmhos/cm | pH | Buffer Index | Nitrate NO3-N ppm | Olsen Phosphorus ppm P | Bray 1 Phosphorus ppm P | Potassium ppm K | Sulfur SO4-S ppm | Zinc ppm | Iron ppm | Manganese ppm | Copper ppm | Boron ppm | Calcium ppm | Magnesium ppm | Lead ppm |
| Medium | 3.5 | 0.5 | 5.6 | 6.5 | 15 | 89 |  |  |  |  |  |  |  |  |  |  |  |  |  |

### Interpretation of Soil Test Results

<table>
<thead>
<tr>
<th>Phosphorus (P)</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>V. High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Potassium (K)</th>
<th>25</th>
<th>75</th>
<th>125</th>
<th>175</th>
<th>225</th>
<th>V. High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>pH</th>
<th>Acid</th>
<th>Optimum</th>
<th>Alkaline</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>4.0</td>
<td>5.0</td>
<td>6.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Soluble Salts</th>
<th>****</th>
<th>0</th>
<th>1.0</th>
<th>2.0</th>
<th>3.0</th>
<th>4.0</th>
<th>5.0</th>
<th>6.0</th>
<th>7.0</th>
<th>8.0</th>
<th>9.0</th>
<th>10.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfactory</td>
<td>Possible Problem</td>
<td>Excessive Salts</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

### Recommendations for: Vegetable garden

- **New Lime Recommendation:** 20 LBS/100 SQ.FT.
- **Total Amount of Each Nutrient to Apply Per Year:**
  - **Nitrogen:** 0.15 LBS/100 SQ.FT.
  - **Phosphate:** 0.2 LBS/100 SQ.FT.
  - **Potash:** 0.3 LBS/100 SQ.FT.
Soil amendment options

1. Compost—organic matter & some nutrients
   a) Leaf/woody waste (DPW, LeafGro)
   b) Food waste
   c) Biosolids (Spotsylvania, Orgro)
   d) Mushroom

2. Manure—organic matter & nutrients
   a) Chicken litter
   b) Horse manure (NPS stables)
   c) Cow

3. Individual amendments
   a) Lime (to lower pH)
   b) Potash (potassium)
   c) Micronutrients
   d) Biological

4. Bloom
The Value in Biosolids

Organic Matter
- Food for soil microbes
- Builds soil tilth
  - Erosion resistance
  - Water-holding capacity
- Ability to retain nutrients

Energy
For Energy Recovery
- Energy in the chemical bonds of organic matter
- 9,300,000 Btu/metric ton of biosolids available through anaerobic digestion

Nutrients
Macro-Nutrients
- Nitrogen (~1.5%)
- Phosphorus (~2%)
- Calcium
Micro-Nutrients
- Zinc
- Copper
- Molybdenum

Drought resistance
- More root & shoot growth
- Improved yields

Beneficial microbes
- Improved nutrient uptake
- Disease resistance
370 million gallons/day (1.4M m³/d) design capacity

Largest advanced Water Resource Recovery Facility in the world
Wastewater treatment = removing solids

...and these solids are plant food!
New solids processing equipment: Anaerobic digesters and thermal hydrolysis
Anaerobic digestion

Organic materials + Nutrients \[\xrightarrow{\text{Anaerobic microbes}}\] \(\text{CH}_4 + \text{CO}_2 + \text{NH}_3 + \text{Biomass}\)
Bloom product characteristics

Class A

Very stable

No debris

Low odor
Markets for Bloom®

- Tree planting, maintenance, nurseries
- Turf grass (turf farms, golf courses, home lawns)
- Landscaping
- Soil blending (e.g. bioretention mixes)
- Restoration & remediation projects
- Green roofs
- Farms & urban gardens
- Homeowners
Commercial distribution (bulk)

2016: ~1,300 cubic yards
2017: ~13,000 cubic yards

Nurseries, landcapers, soil blenders, gardens, wetland restoration, highways
Map of garden use

- 80+ comm. gardens & tree plantings (700+ tons)
- 800+ tons to employees and on-site
Vision for Bloom (2016)
Vision becoming reality
### Presence ≠ toxicity

<table>
<thead>
<tr>
<th></th>
<th>Biosolids</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lead</strong></td>
<td>14 ppm¹</td>
<td>50-400 ppm: naturally occurring in soils³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 ppm: recommended limit for gardening⁴</td>
</tr>
<tr>
<td><strong>Triclosan</strong></td>
<td>235 ppb²</td>
<td>3,000,000 ppb: Colgate toothpaste</td>
</tr>
<tr>
<td>(anti-microbial)</td>
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<td></td>
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<tr>
<td><strong>PBDEs</strong></td>
<td>200 ppb²</td>
<td>500,000: household dust</td>
</tr>
<tr>
<td>(flame retardant)</td>
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</tbody>
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¹: parts per million = one drop in the fuel tank of a car
²: parts per billion = pinch of salt in ten tons of potato chips
³: [EPA](https://www.epa.gov)
⁴: [Univ. of Minnesota Extension](https://extension.umn.edu)

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• Available now for bulk sales
  • Helps reduce rate increases!
• Reduced price for non-profits
  • $75/4 cu yds delivered
  • $125/dump truck delivered
• Use like compost:
  • Apply 1-2” and work in 6-12”
• Vegetables, herbs, trees, grass, etc.
Option for food waste
(and other high-strength organic wastes)
There is no such thing as waste, only wasted resources.

Bill Brower

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