CASE STUDIES - Compost Use for Wetland Compensation

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Wetland Protection versus Development (the stand-off)

In the case of land development projects, the primary wetland functions that need to be reinstated, replaced or enhanced consist of the following

1. Wetlands facilitate the earth's surface to absorb and retain storm rainwater events and prevent downstream floods and property destruction,

2. Wetlands provide a natural protective barrier for infiltration (and cleaning/buffering) and directing surface water from precipitation and snowmelt towards recharging groundwater sources,

3. Wetlands support and sustain a wide range of flora and fauna who survive off the natural wetland ecosystems.
Replacing Wetland Functions with Compost Enriched Topsoil and Bio-Retention

We believe that the above three key wetland functions can not only be reinstated and replaced, but may even be enhanced through implementation of a simple set of Sustainable Residential/Commercial Land Development Practices as follows;

1. All land areas within the total development footprint must be capped and re-vegetated with a minimum 6-inch layer of organic-matter enriched topsoil (note that organic-matter enriched soils have the ability to absorb and retain 1.88 gallons per cubic foot and that would far exceed any natural wetland soil type),

2. All land areas which must be unavoidably developed directly within an area of exposed surface water of a wetland should be replaced with a constructed wetland providing similar capacities (note constructed wetlands can be designed to provide equivalent capacity through smaller footprint by utilizing greater thickness of organic-matter enriched wetland soil and use of hydraulic controls),
Replacing Wetland Functions with Compost Enriched Topsoil and Bio-Retention

These Sustainable Residential/Commercial Land Development specifications, could be implemented through a number of potential avenues.

• A Municipality could enact a bylaw for development within municipal lands,
• Provincial Environment could provide new land development guidelines or best management practices for mitigation of wetland alteration,
• The current Wetland/Watercourse regulations could be revised to reflect the opportunity to mitigate/reinstate wetland functions using organic-matter enriched topsoil and constructed wetlands practices.

These discussion points have been sent to representatives of NB Environment, Municipalities, Property Developers and other Stakeholders to assist in alleviating the current situation.
Other benefits of Compost Amended Soils
Rate at which micro-organisms degrade contaminants is influenced by: oxygen, moisture, nutrients, pH, temperature, availability and toxic inhibitors.

Biological Mechanisms:

- Biological degradation (hydrolysis/oxidation),
- Cellular decomposition (molds/fungi/mineralization),
- Adsorption, and
- Volatilization

Success with Organic Pollutants including:
- Fuels, Explosives, VOC’s and Semi-VOC’s
- Metals: Arsenic, Cadmium, Lead, Zinc
Measurable Results from the Field
Use of compost within a constructed wetland soil provides the following benefits:

- Rapid development of wetland plants and ecosystem components including microbes, insects and wildlife
- Compost soil media provides increased precipitation/run-off infiltration rates (>1” per hour) and water holding capacity (2.3 gallons/cu.ft)
- Increased plant survivability
By introducing dredge spoils into a compost windrow you can biologically dry the material, stabilize pH and salinity and introduce organic matter and nutrients providing an excellent manufactured topsoil grade.
## Compost Use for Sports Fields

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Topsoil Specification</th>
<th>Treated SOILS</th>
<th>Compost Amended Mix 1:1</th>
<th>Compost Amended Mix 2:1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>pH</strong></td>
<td>5.5 – 8.0</td>
<td>5.2</td>
<td>7.8</td>
<td>8.1</td>
</tr>
<tr>
<td><strong>Moisture Content</strong></td>
<td>30-55%</td>
<td>79.1%</td>
<td>43.2%</td>
<td>33.1%</td>
</tr>
<tr>
<td><strong>Soluble Salts</strong></td>
<td>2.0mmhos (dS)</td>
<td>4.6mmhos (dS)</td>
<td>1.6mmhos (dS)</td>
<td>0.7mmhos(dS)</td>
</tr>
<tr>
<td><strong>Organic Matter</strong></td>
<td>&gt;5%</td>
<td>1.5%</td>
<td>7.2%</td>
<td>9.6%</td>
</tr>
<tr>
<td><strong>Sand (0.05 – 2.0 mm dia. Range</strong></td>
<td>45%-75%</td>
<td>90.3%</td>
<td>67.5%</td>
<td>64.9%</td>
</tr>
<tr>
<td><strong>Silt (0.002 – 0.05 dia range</strong></td>
<td>15% - 35%</td>
<td>6.1%</td>
<td>19.0%</td>
<td>18.8%</td>
</tr>
<tr>
<td><strong>Clay (&lt;0.002)</strong></td>
<td>5%-20%</td>
<td>3.6%</td>
<td>13.5%</td>
<td>16.2%</td>
</tr>
</tbody>
</table>
CASE STUDIES for Compost Use;

a) Northeast US States
b) Atlantic Canada
Typical Brownfield sites contain “Urban Soils” characterized by low-level metals (lead, arsenic, cadmium, zinc..etc) and/or organic pollutants (TPH, PAH, PCE, pesticides …etc.).

Real Estate remains under-utilized due to perceived “high treatment costs”.

Brownfield soils can be amended with compost within ex-situ windrows whereby “biological degradation processes” act to reduce contaminants to within acceptable CCME Soil Quality criteria.
Compost Use in Urban Brownfield Soil Stabilization

Sydney, Cape Breton
“Tar-Ponds to Parklands”
Brownfields can also be capped with a 2-4 foot thick layer of horticulture-grade “Compost Manufactured Topsoil” as in Staten Island NYC.

Ecological Landscapers have developed a 10-year Parkland Development Plan with lawns, sportsfields, biking/walking trails, and multi-purpose wetland/watercourse habitats.
Amending acidic, low organic-matter disturbed landscapes with compost will promote vegetation establishment with long-term “survivability”.

Decreases erosion, adheres metals and prevent acid drainage run-off.

Application rates for compost are recommended between 200-400 tonnes per acre to increase organic matter to >4%.
Amending low fertility and low organic-matter farmland soils with compost will sustain crop yields as well as provide many other environmental benefits. Decreases erosion, adheres nutrients and sustains soil biology and beneficial micro-organisms for plant health.

Application rates for compost are recommended between 50-100 tonnes per acre to increase organic matter to >2%.
Also the implementation of Compost Organic-Matter Enriched Vegetated Buffer Strips along farm fields have been proven to provide an excellent preventative barrier to nutrient run-off or leachate.
Composting Processes for Use In Enhancing Bioremediation

Compost processes are utilized within ex-situ bioremediation windrows to accelerate breakdown and degradation of organic contaminants.
Control of thermophilic (biological heat), meso-phillic bacterial and fungi microbial degradation processes inherent within composting for destruction of petroleum compounds and reduce bio-availability of metals.
Triple Bottom Line Analyses
Economic

- Increased Direct Employment
- Creation of new, Compost-Based Product Sales
- Increased GDP

Environmental

- Beneficial Re-Use of Waste
- Reduced Landfilling and/or Incineration
- Preserves Natural Peat Moss and Topsoil Environments

Social

- Strengthens Rural Communities
- Healthier People Resulting From Use of Organics
- Good News Story
Community Relations
Innovative Projects

- Compost Topsoil Manufacturing
- Dredge Spoil Stabilization
- Contaminated Sludge Bioremediation
- Pulp Mill Biosolids Composting
- Manure Pelletizing for Organic Certified Crop Inputs
- Anaerobic Digestion for Biogas
- SSO Processing: In-Vessel and Windrow
- Composting for Pathogen and Disease Destruction – SRM, Dead-stock, Cull Potato, Mussel Shell
Envirem Organics Inc.
compost supply capacity
Envirem Location Map
FREDERICTON FACILITY
(Established 1994)
BELLEDUNE FACILITY
Belledune, NB (est. 1995)
MEMRAMCOOK FACILITY
(Established 1996)
MIRAMICHI BAGGING FACILITY
(Established 1997)
Miramichi Bagging Facility

- Annual production of over 8M bags of composts, bark mulches, soils and growing mixes
  - 4 Bagging Lines; 2 Fully automatic Premier FFS lines and 2 semi automatic lines
  - 4 inline star screeners
  - 1 Morbark 1300 V-mill Grinder
  - 2 Trac PTE628 Trommel Screeners
  - 1 McCloskey 512 Trommel Screener

- Over 100 sku’s ranging from 5L – 85L in size

- 100 acre compost facility handling approximately 100,000 tonnes per year of forestry, fishery, industrial and agricultural residuals
BAYSIDE ANAEROBIC DIGESTER
(Established 2000)
EAST RIVER COMPOST FACILITY
East River, NS (Established 2002)
SAINT FRANCOIS COMPOST FACILITY
Saint Francois, NB (est. 2003)
Granular Organic Fertilizer
Pelletized Poultry Manure

- Pelletizing Plant contains dryer, grinders, mixers and pellet dye to pasteurize, compress, and produce granular fertilizer from poultry manure.

- Produced in two different grain sizes for turf or agricultural applications

- End product fertilizer provides organic matter, nutrients, iron, calcium, lime, and microbial matter to soil for overall soil health.
Clarendon Compost Facility
Clarendon, NB (Established 2004)
Riviere-Verte AGRI-Supply
Compost Facility (est. 2010)