The Quality of Composts & Organic Material Implications for Use

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Feedstock

- Food waste
- Food processing
- Manure
- Weeds
- Garden residuals
- Leaves
- Yard waste
- Pond weeds
- Fish/meat
- Biosolids
- Dairy Waste

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Common and Uncommon Feedstock

The list is endless and includes anything, plant or animal, that was alive and is now dead and needs to be managed. Crop residual, Food processing residual, Orange, carrot, banana and apple pulp, Livestock manure, Dog manure, Zoo doo, Biosolids-human manure, Coir, Chipped Christmas trees, Mixed leaf and Yard residual, Eggs/egg shell, Mixed food waste (residential, grocery, school, restaurant, etc.) Out dated soda and alcohol, glucose solutions, Brewery waste from, micro-breweries, Fruit leather residual, Currency (from the US Mint), Burnt grain from an elevator fire, Cherry/stone fruit pits , Garlic/ onion processing residual, Paper from document destruction, Bread dough/bakery excess, Seized and legal cannabis, residual, Floral and cut flower production waste, Coffee/tea grounds, Cocoa, coffee, rice hull, Off-spec. pet food, Dog and cat treat dust, Off-spec. human food, Canned and contained, foods, residual from fish canneries and slaughterhouses, Fruit & Vegetable peelings, Acai, Grape, Apple, Olive pressings, Poultry feathers, Livestock wool, Butcher residuals, Blood: liquid, semi-solid or dried, Whole whales & marine mammals, Fish from fish kills, Sea weed/ lake weed, Seafood shell, Fish and fish guts, Paper, Vanilla bean residual, Sunflower seed shell, biochar, whey- all different compositions, Milk/ice cream, Liquid manure, FOG: fats-oils-greases, Gummy vitamin residual, Gel caps from drug manufacturers, Coir, Bagasse, Drywall/ untreated size reduced wood, Livestock/deadstock, feed, water, eggs, milk and bedding/litter from disease outbreaks.

*food

Crop Requirements & Soil Testing

- Test soil nutrients
- Organic Material - Can you have too much
- pH
- Know crop requirements

Leaf & Yard Residuals

Inerts - garbage

Herbicides/Pesticides

Lead

Salt Level

Orchards- Food scraps
To apples

Food Scrap & Processing Residual

- High in Salt
- Physical Contaminants
- Varies with Feedstock

Compost Parameter	Typical NYS Range		Description
PHYSICAL PROPERTIES	**Dairy***	**Poultry****	
Water holding capacity (%)	88-243	88-173	The amount of water that can be retained by compost and is available to plants.
Organic matter (%)	18-70	24-54	Material in compost that came from, or is, living matter and is composed of plant residues, microorganisms, and humus. Organic matter can often be used to determine the extent of decomposition in a compost pile. Very low organic matter may indicate heavy mixing of non-organic soil matter.
Carbon to nitrogen ratio (C:N)	11-19	4-16	A value obtained by comparing total carbon to total nitrogen. This value is one of several factors used to measure the rate of compost decomposition, though it should never be used as the only indicator.
Density (lb/ft^3)	38-58	30-60	Provides a measure of how easily air and water can move through a compost pile. Lower means better flow and higher means poorer flow.
Moisture (%)	23-53	51-78	Measure water content. Moisture content changes over time as organic matter is broken down, but ideal range is 60% to 80%.
Inert or oversize matter (%)	1-11	1-10	Any material that does not have nutritive of chemical value in compost, such as rocks, pebbles, glass, plastic, and other debris or matter.
PLANT NUTRIENTS	**Dairy***	**Poultry****	
Total nitrogen (%)	1-3	1-7	A measure of total nitrogen. This value includes both organic and inorganic forms of nitrogen in compost. In mature composts, most nitrogen should be organic, which indicates that a compost is mature.
Organic nitrogen (%)	1-3	1-7	The fraction of total nitrogen that is chemically associated with carbon in some form. In mature composts, organic nitrogen should explain most of total nitrogen presence.
Phosphorus (%)	0.2-1	0.3-2	An important plant macronutrient and mineral. In excess, a potential environmental contaminant.
Potassium (%)	0.2-2	0.3-3	An important plant macronutrient and mineral. Important for water movement into and out of plant cells.
Calcium (%)	1-6	6-15	An important macronutrient. Component of plant cell walls and enzymes.
Magnesium (%)	0.4-1	0.5-1	An important macronutrient. Important part of plant energy production from sunlight.
Nitrates (ppm)	<2-878	<2-2033	A form of inorganic nitrogen that is readily available to plants.
Nitrites (ppm)	<2-3	<2-<2	A form of inorganic nitrogen produced under certain conditions from ammonia that is toxic to plants. Elevated levels in compost may cause damage to plants.
Chloride (ppm)	137-	270-	Plant micronutrient. Important for cellular water transport and plant energy

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Chloride (ppm)	137-6650	270-10471	Plant micronutrient. Important for cellular water transport and plant energy production.
Sulfates (ppm)	<4-898	55-3060	A form of sulfur, which is a plant macronutrient. Important for general plant functions.
Copper (ppm)	26-572	16-93	Plant micronutrient, but toxic to plants at elevated levels. If copper sulfate is used in agricultural settings, then compost should be tested for copper.
Iron (ppm)	1106-13886	293-10765	Plant micronutrient.
Zinc (ppm)	99-349	171-597	Plant micronutrient, but toxic to plants at elevated levels.
Ammonia	4-18	644-2347	Toxic to plants. In compost, animal excretions are a common source. A source of available nitrogen.

HEALTH CONCERNS	**Dairy***	**Poultry****	
Cadmium (ppm)	1-4	2-5	A potential health risk and potential environmental contaminant.
Arsenic (ppm)	<6.5-14	<6.5-15	A potential health risk and potential environmental contaminant.
Fecal coliforms (most probable number/gram)	<3-6580	<3-7	An indicator or relative health risk from bacteria that grow in conditions matching that of the human digestive tract. Note – Many fecal coliforms don't cause illness, but grow in similar conditions as those microbes that do.
Salmonella (most probable number/4 grams	1.2-3.0	1.0-1.1	An indicator of relative health risk. Note – only select species of *Salmonella* cause illness, and conditions must also be ideal for sickness to occur.

PLANT RESPONSE	**Dairy***	**Poultry****	
% germination	88-105	9-102	Percent of cress germinating in control vs compost (diluted to standard salinity).
% growth	57-102	12-113	Weight of cress grown in control vs compost (diluted to standard salinity). Expressed as %.
Weed seeds	0-16	0-12	Weed seeds are undesirable in gardening, potting soils, and other applications. Weed seed counts are valuable for ensuring low values.

Manure Compost

- High in Organic Matter ?
- Low in contaminants
- Little garbage or inerts
- Can be high in P
- Pharmaceuticals

Manure Compost Samples

Average values for selected analyses

	pH	% Organic Matter	Fecal Coliform MPN/g (range)	Weed Seeds Count/L
1A (n=6)	7.8	67	<2 to 800	1
2B (n=4)	7.7	28	<2 to 2	1
3F (n=6)	8.5	68	17 to 3500	0
3FB (n=4)	8.3	55	<2 to 11	0
4G (n=4)	7.9	24	<2 to 140	3
4GB (n=4)	7.9	25	140 to 1700	8
5H (n=4)	7.8	57	11 to 700	0
6PB (n=4)	7.9	87	1300 to 28000	0
7WA (n=5)	6.5	38	<2 to 300	6
8WI (n=6)	7.8	43	<2 to 2	98

Metal Results

	As	Cd	Cu	Hg	Pb
1A	<2.3	2.1	509.3	0.023	17
2B	6.3	1.6	34.9	0.039	24
3F	<2.3	2.4	529.0	0.029	19
3FB	<2.3	2.4	265.0	0.029	29
4G	18	3.6	28.9	0.024	56
4GB	29	3.6	30.1	0.057	58
5H	34	4	366.0	0.05	17
6PB	17	2.8	32.0	0.026	<8
7WA	5.7	1.7	26.1	<0.02	20
8WI	23	2.2	777.7	0.032	20
NYS Soil	<9	0.2	20	0.1	15
NYS 360		25	1000	10	250

(dry basis unless specified) (units ppm)

Fat, Oils, Meat

- Highest in Nutrients
- Physical Contaminants
- Use Limitations

Biosolids Compost

- Inerts
- Chemical Contaminant
- PFAS/PFOA
- Bacteria
- Viruses
- Drugs
- Change in feedstock
- Use Limitations

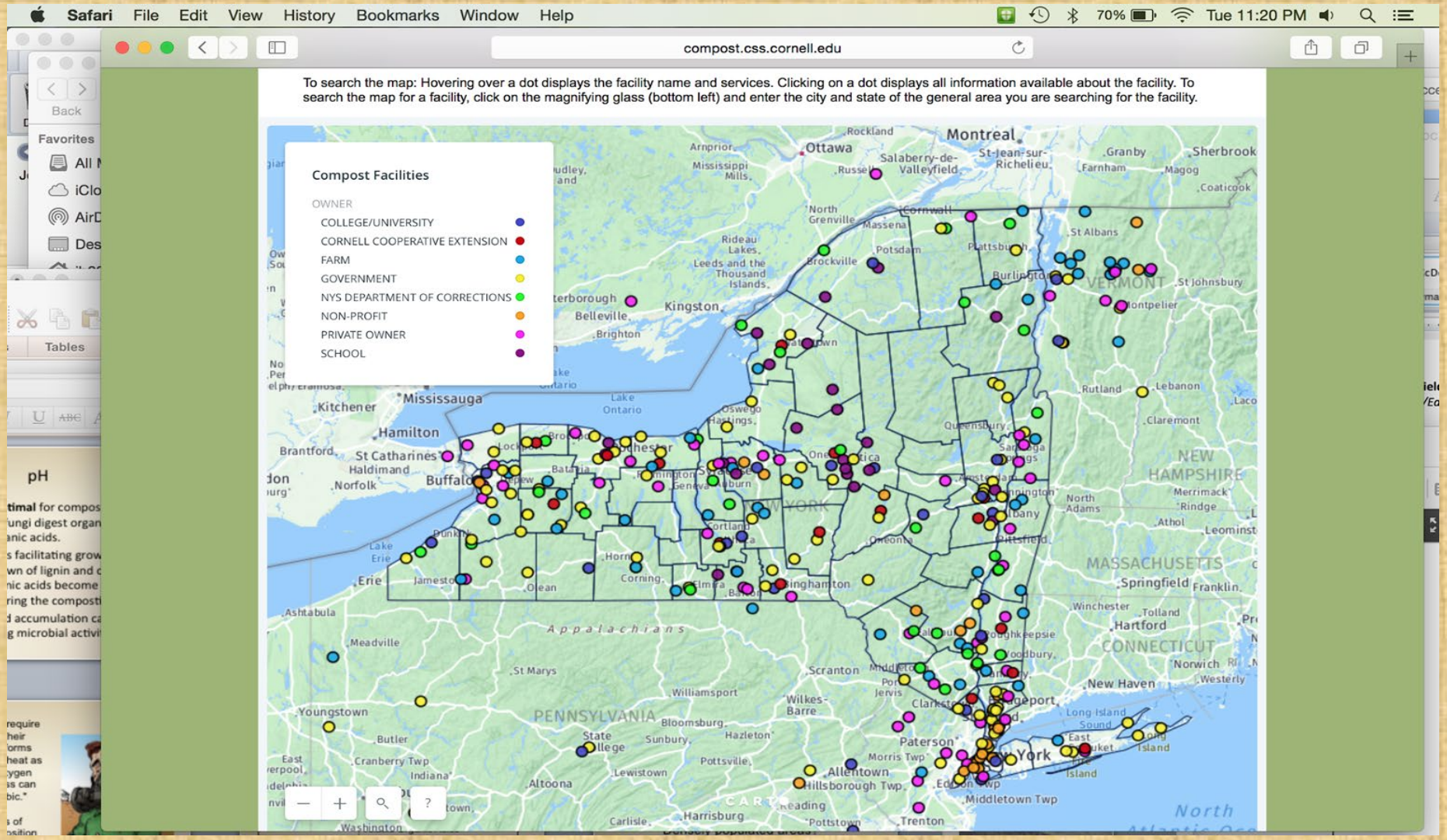
Pathogens

Fecal < 1000 MPN/g or Salmonella s.p. < 3 MPN/4g (based on seven individual samples per event)

AND

Use one of 5 approved methods to Further Reduce Pathogens:

– Time/temp depending on solids content
– pH/time then dry to at least 50% solids
– Testing for enteric viruses/viable helminth ova
– Testing for reduction of these analytes



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Compost Use for Improved Soil

Make it and Use it: Urban Environments

Earth Matter:
Make it Turned windrow
Use it Vegetable production

Fresh Kills:
Make it Turned windrow
Use it Top dressing for landscape beds at golf course (left)
Amend on-site soils for turf establishment (below)
Photos courtesy of WeCare Compost

Earth Matter: Make it
2-yard bin; passively aerated

Use it Vegetable gardening

NYC Compost Project hosted by NY Botanical Garden: Make it Compost curing area
Use it Street tree planting

Red Hook Community Farm: Make it Compost windrows created and maintained entirely by solar, wind, and human power
Use it Community Farm

St. John's University: Make it
In vessel composting, compost tea brewer

Use it
Apply tea to soils of tree roots and shrub planting beds in late April and September

LESEC: Make it In-vessel (hot-phase): alternating layers food waste and sawdust.

Turn out to windrows: red wiggler worms finish the job

Use it
Street tree

Photos courtesy of NYC Compost Project hosted by LESEC

Earth Matter: Make it
3-bin system; passively aerated

Use it
On-site beautification

Find your compost here: http://compost.css.cornell.edu/maps.html

Funded in part by New York State Department of Environmental Conservation

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COMPOST
SOIL NEEDS IT
FEED THE SOIL
Landscaping
Backfilling
Cornell Waste Management Institute
Land Spreading
Top dressing
Gardening
SPREAD IT AROUND

Improves Highly Compacted Soils

Hydro-seed with Compost/Soil Mix


March 2007

Application to 1:1 ROCK SLOPE
2” compost mulch w/native seed mix
Barton Creek Development – Austin, TX
AUGUST 17, 2002

8 MONTHS LATER
IRRIGATION INSTALLED, NEVER USED

West Cypress Hills on October 05, 2004. Before Compost Application


JAN 11 2005

Wetland Mitigation in Adirondack Park

Establishing Vegetation

Compost Socks

Carbon/Feedstocks

- Fine Carbon

Mixed Carbon

- Coarse Carbon

Very Coarse Carbon

Filter Tubes Installed for Storm Water Protection

Tree Establishment

3 years without amendment

3 years


CL100

Landscaping Project


YANMAR

http://cwmi.css.cornell.edu

Homer

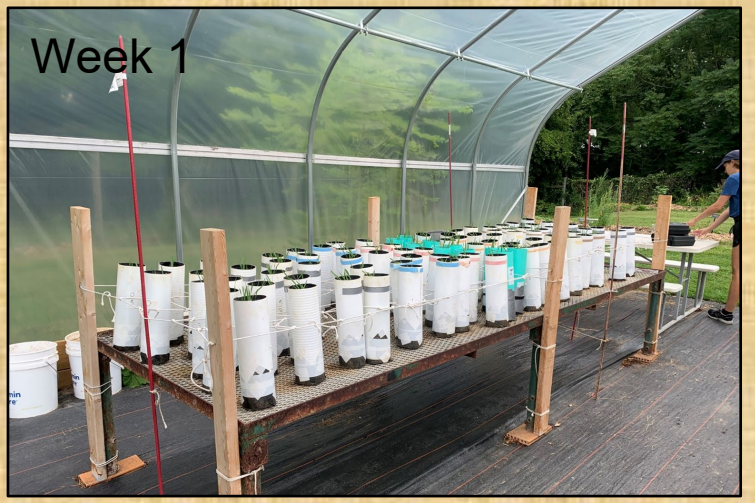
Undercut bank

4 months later

Socks in road ditches

Ditch into a Creek

Eroding Stream Bank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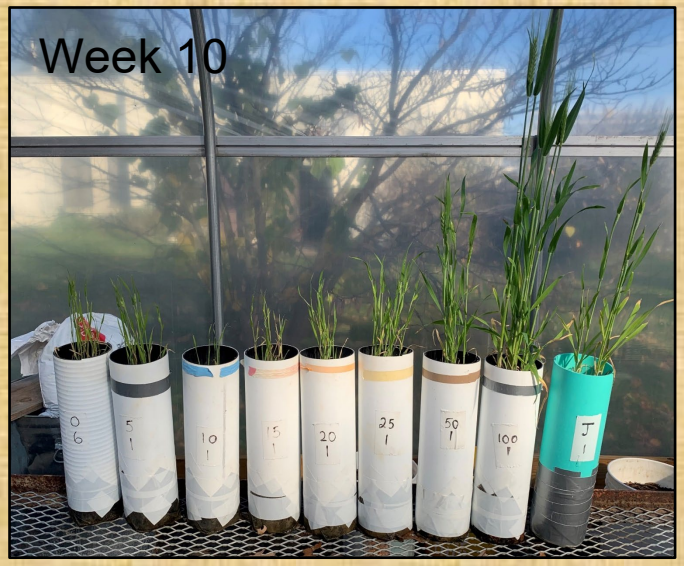
Week 10


3.6

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Landscaping
Backfilling
Land Spreading
Gardening
Top dressing
SPREAD IT AROUND

Recycling Organics Makes Good Sense!

Healthy Soils =
Healthy
Food!

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