

The Art and Science of Composting: Restoring Function in Soils

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Plant
Natives!
We'll talk
about this
more later 😊



THE COMPOST FAIR



The Giant Hogweed Project



Feed Soil, Not Plants!

- In addition to macronutrients (NPK), compost provides Boron, Cobalt, Copper, Iodine, Iron, Magnesium, Zinc, and more
- Plants need at least 17 nutrients to survive: science finds more all the time
- Making these nutrients available boosts immune strength in plants, and makes them more resistant to disease, pest, drought and other stresses
- The addition of compost to depleted soils increases pore space through adhesion to clay and silt (crumbly soil is good soil!), maintains high rates of cation exchange over longer periods of time, improved drainage, and greater dissolved oxygen in soil
- All this leads to healthier plants, faster growth rates, higher production, and greater yields

Feed Soil, Not Plants!

- Compost conditions and rehabilitates soils and provides for long term plant community health, reducing or eliminating synthetic chemical inputs that create a culture of dependency



Feed Soil, Not Plants!

- Organic compounds can help remediate contaminated soil by creating soil bonds with heavy metals like lead and cadmium, making them unavailable for uptake by vegetation



Feed Soil, Not Plants!

- Compost also creates a healthier environment for a balanced soil biota, which is sometimes referred to as “land plankton” because of its critical role in the food web



Feed Soil, Not Plants!

- Let's talk about those soil critters:
- What do they need?
- Much like us, they need:
- Carbon (like carbohydrates) – for energy: comes from fibrous plant material (think lignin from trees, the brown stuff)
- Nitrogen (protein) - for creating mass, and to create enzymes to breakdown food (grass clippings and kitchen scraps. Watch out for too much!)
- Moisture – somewhere in the range of 40-50%
- Oxygen – at least for the aerobic organisms

Feed Soil, Not Plants!

- Anaerobic vs. Aerobic: Which ones are we hoping for, composters?
- Why?
- Aerobic bacteria are more productive than anaerobic bacteria by an order of magnitude, and anaerobes often have a pathogenic relationship with plants
- Why are they more productive? Feedback loop created in energy catalyzed by O₂ in soil. More O₂ = More N, P & Mg + Keep your compost aerated!!

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- Who are our aerobic friends?
- Psychrophiles – Usually the first to show up, these are the cool temp bacterium (4-15C), they make amino acids, eat lignin and cellulose (trees), and work for us in the winter sometimes (at least in Memphis!)
- Mesophiles – Second wave moderate temperature bacterium (18-30C), and generally the most abundant. Among these is **Actinomycetes** (hybrid fungi + bacterium) which are the true decompositional closers, create those neat grey cobwebs
- Theromophiles – The showoffs, they are the high temp metabolizers that make your compost smoke like Lonely Mountain

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- Mycorrhizae – usually develop in the soil (deep soil mineral miners)
- Have an ancient relationship with trees
- Symbiotic connections throughout the rhizosphere
- Digest cellulose, lignin, starches & protein (sometimes insects)
- Anyone like Podcasts? Radiolab has a great episode on Mycorrhizae

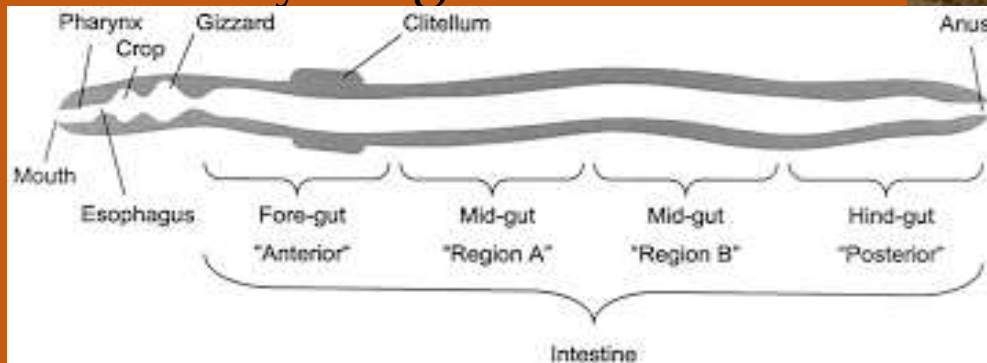


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- What about a little higher in the food chain?
- Macro-organisms
- The mighty earthworm, insect larvae, reptiles, rodents and more
- Increase surface area for bacteria to colonize
- Increase pore space
- Their waste is processed into additional nutrients

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- Lets talk about that waste!
- Earthworms: something magical happens in the gut of an earthworm wherein nutrient output is greater than input (magic = enzymes)
- Worm castings = single most nutritious soil amendment. They create their bodyweight in them each day



Feed Soil, Not Plants!

- Benefits:
- 60+ micronutrient compounds
- Create symbiosis: beneficial pathways between bacteria and plants
- Regulate Ph (buffer)
- Move organic matter vertically through the soil up to 1m
- Pest control: create enzymes that repel aphids and white flies
- Extract manmade toxins (even heavy metals), and pathogenic bacterium and fungi from soil solution

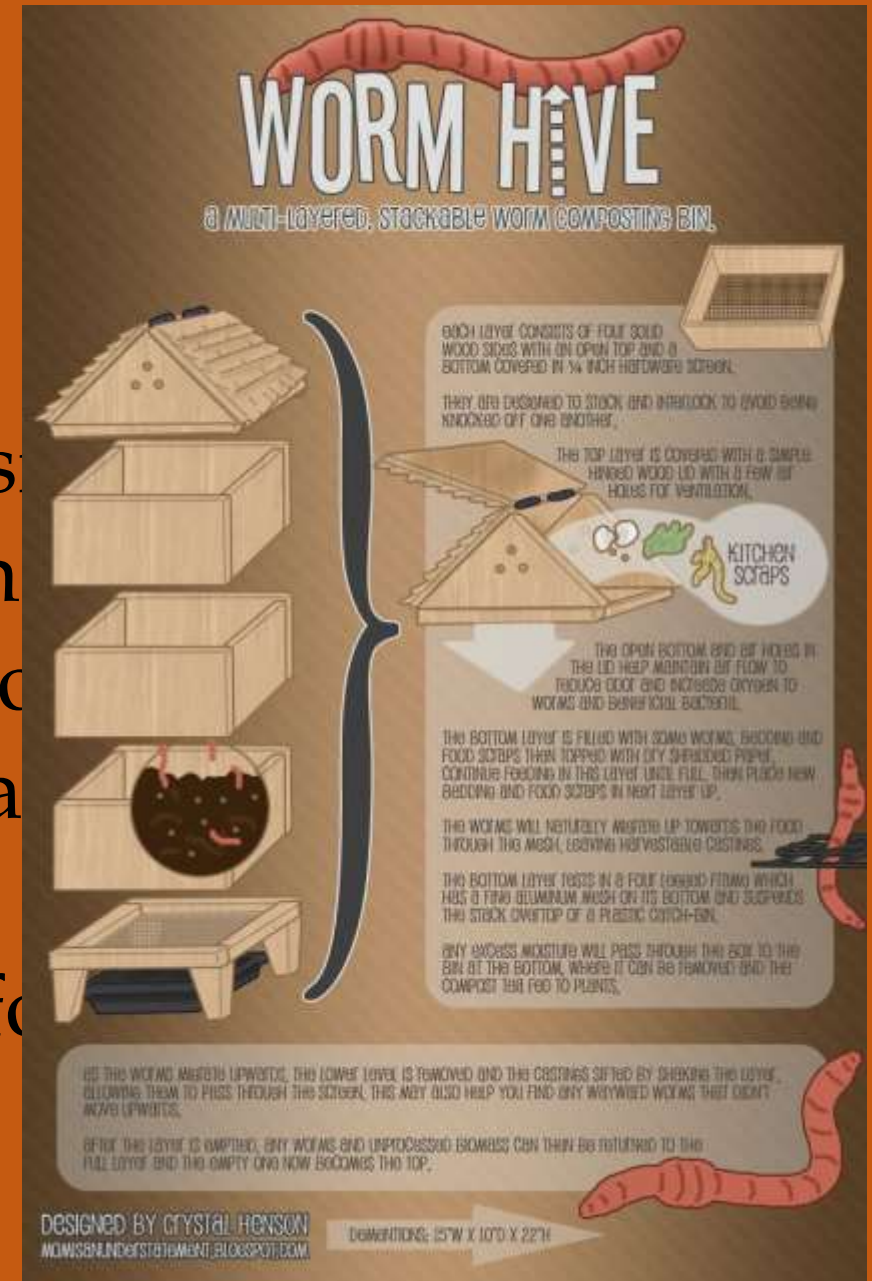
Feed Soil, Not Plants!

- Vermiculture/Vermicomposting = Worm farming



Feed Soil, Not Plants!

- Very simple
- Don't drown them (drainage). Easily accomplished through construction
- Don't let them suffocate (ventilation)
- Worms are shy, so give them a black environment (shredded newspaper or leaves)
- Feed them (no eggshells, cooked food, animal products, onions & garlic)



Soil Building and Rehabilitation

- Composting in all it's various forms is a simple way we as individuals can act to correct huge planetary scale issues like:
- Global warming
- Overburdened landfills
- Leachate entering groundwater/ drinking water supplies
- Over reliance on synthetic chemical inputs in agriculture
- How can compost impact agriculture on the commercial/ industrial scale?

Soil Building and Rehabilitation

- **Carbon Farming**
- What is it?
- Carbon Farming is simply farming in a way that reduces Greenhouse Gas emissions or captures and holds carbon in vegetation and soils. It is managing land, water, plants and animals to meet the Triple Challenge of Landscape Restoration, Climate Change and Food Security.
- Bright light in the fight against climate change. Most buzz of any topic in the sustainable food movement.
- Some experts (like Paul Hawken) feel that if properly implemented on a large scale, it could surpass the productivity of industrial agriculture.

Soil Building and Rehabilitation

- How does it work?
- Carbon Farming involves implementing practices that are known to improve the rate at which CO₂ is removed from the atmosphere and converted to plant material and/or soil organic matter.
- The practice of carbon farming takes excess carbon out of the atmosphere that has been released by mechanized industrial agriculture (according the World Health Organization, it is the second greatest contributor to atmospheric CO₂), and store it in the soil, where carbon aids the growth of plants.
- Could transform agriculture from a net emitter of CO₂ to a net sequesterer