

Chapter 3 How Soil Works

Plant & Soil Relationships

By now I think you have a good understanding of what a living soil is. I'll assume at this point, when referring to living soil, I can drop the word "living" since dirt is lifeless, and soil is lively.

Through the explanation of the organisms and their functions in the soil, it's almost second nature in understanding how soil works. This is most of the equation.

I'll discuss how everything is assembled through the autotrophic and heterotrophic process of the soil food web in relation to how the plant grows and assimilates the nutrients

I don't want to get into the weeds on this subject. However, I think it's important to discuss the two (maybe three) types of trophic species.

- **Autotroph** – an organism (plants) able to create its own food.
- **Heterotroph** – an organism that must obtain/find its food from other sources. Most microbes, plus animals and humans, are heterotrophic.
- **Mixotroph** – This is an organism that can make its food, as well as consume other organisms. Such organisms are phytoplankton which live on the surface of the ocean to absorb CO₂. Plants, like the Venus Fly Trap, will trap and digest insects as well as photosynthesize.

I'll not discuss the mixotrophs as they're not essential for growing the food and medicine a gardener needs for sustainability. Interestingly though, much of the Earth's oxygen comes from these plant-like organisms growing in vast oceans, along with other algae and diatoms. Diatoms will be an important discussion for later, in regard to how I utilize them.

The Food Chain

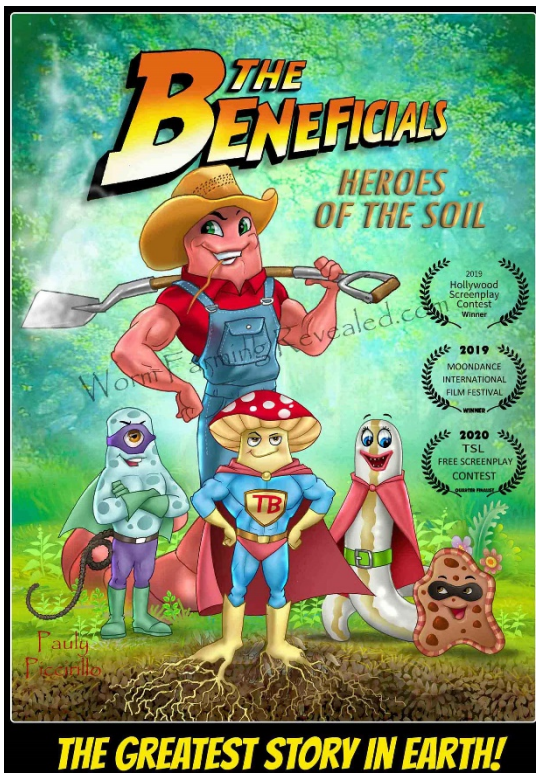
Earlier I stated that bacteria are at the bottom of the food chain. I want to begin with lifeless dirt and progress into a thriving habitat for ALL LIFE.

Some land (even over farmed land) contains nothing but compacted clay, sand, silt, rocks, etc. I don't want you to think these aren't useful elements (if you've skip to this section already), they are. These are wonderful resources.

They just need to be unlocked, because **without this lifeless dirt, we can't have life**. Holding a handful of minerals does nothing until we swallow them and allow the microbes to break them down into a soluble form.

How to "Wake Up" Dirt

When it comes to the transportation of nutrients, there are some key players that do some extraordinary things.



The Beneficials® Award-Winning Screenplay

These are **POWERHOUSE** microbes, and there is no doubt they will team up and start laying the building blocks of soil.

They are...

The Heroes of the Soil

- Bacteria
- Fungi
- Protozoa
- Nematodes

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If introducing microbial activity into the dirt, the process in which to inoculate it is by means of a few different approaches.

1. Compost
2. Compost tea/extracts
3. Carbon litter

Compost can be made in many forms. My two favorites: **1)** Indoor worm composting **2)** Outside carbon compost piles with some added kitchen scraps. The kitchen scraps aren't necessary, but better to compost than go to the landfill.

Of course, you won't be spreading layers of worm castings over an entire garden or several acres of land, but getting it sprinkled in is greatly beneficial. Worm poop has become widely acknowledged among academia and practical gardeners as containing the four major microbes listed above.

If you do consider adding beneficial fungi, worm compost is full of fungi.

Compost tea (Aerated Compost Tea) and **tea extracts** should contain all the microbial organisms necessary to begin feeding on the minerals or any organic matter you add to the dirt or any ground you're wanting to boost.



My Aerated Process

The aerated tea is microbial farmed to breed the desired microbes you're wanting to introduce into the plot.

The microbes will double (when brewing) in a matter of minutes (depending on what catalyst is used) in favorable conditions within 24-36 hours.

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This is extremely efficient and cost effective as it can cover huge areas. Size is no match. It has the ability to penetrate as deep as the ground will absorb it and the amount that can be produced is endless.

Tea extracts are not as potent. This is NOT an aerated process for the rapid multiplication of organisms. This process is made with finished (mature) compost soaked in water for a period of days or less, for the extraction of microbes.

This process is much less stable and risky, due to the lack of aeration.



Compost Tea Extract

Most of the time these are good extracts when done properly with mature compost. Without the aeration process and if soaked for too long, it can wake up some harmful pathogens. However, it's still getting good nutrients into the desired area.

Carbon litter or a cover mulch can consist of many different dead brown materials from wood chips, and leaves, to grasses, and straw or other shredded woody products, and so on.



One of My Free Truckloads

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The microbes consume the material, much like a mesophilic compost pile, and begin working their way downward into the ground. If dirt was completely void of any life, now the worms, arthropods, and larger animals begin to move in.

Seeds that may have been dormant, seeds from the carbon litter, or seeds conveyed from animals, begin to germinate.



One of my mesophilic compost piles

This creates the plant exudates the microbial community (and all other life) will need to thrive in this new “desert turned to oasis”. This proves once again, that **without plants, there can be no life.**

There are so many working components and each one isn't more important than the others.

How Nature Creates Soil

After applying any of these methods for microbial inoculation, the process runs itself. In fact, if you really think about the big picture, nature already performs these three major functions of adding and recycling nutrients into the soil.

Picture grasslands or forests. The floor is dense with previous plant matter fallen from above (carbon litter). Microbes convert it into compost for plants to feed on (compost piles, but a smaller scale). Some plants immediately feed on it, while other plants wait for the soaking rains (tea extracts) to penetrate through several feet down. This could be a quick “compost drench” to a thorough soaking, depending on rain volume. Because the soil is so porous and aerated, fungi will also convey the nutrients over vast areas vertically and laterally.

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Some of my garden pics



Zucchini Plant



Cucumber Plant



Cucumber Leaves



Assassin Bug Eating Squash Bug