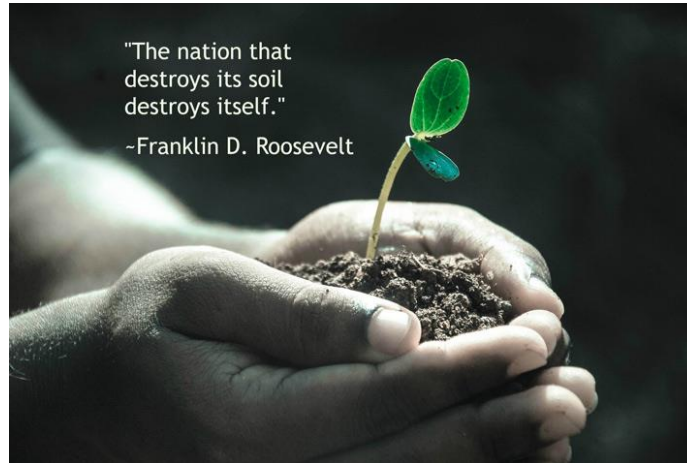


The Soil – Pollinator Connection

Insight from Soil Scientist, Dr. Elaine Ingham by Kenda Swartz Pepper

A conversation with Dr. Elaine Ingham, Soil Scientist, Soil Life Consultant, and President of Soil Foodweb, Inc., brought to light the importance of soil health in relation to pollinator health.



Dirt is dead.

That sounds so Nietzsche-esque, but I'm not waxing philosophical. It's a scientific reality. Dirt is devoid of life, of all-things nutritious for the flora that rely on it. Soil, on the other hand, is alive.

A recent conversation with Dr. Elaine Ingham, Soil Scientist and President of Soil Foodweb, Inc., enlightened me to the *other world* that lives beneath our feet. Soil is rich with life. It has communities with billions of microorganisms—a natural biology of bacteria, fungi, protozoa, and nematodes—that interact with the entire ecosystem to protect and feed plants while building soil structure so roots grow deep. These microorganisms can decompose chemicals in the soil that are toxic to plants. This is *the soil food web*, and when these communities of microorganisms are present, plants will be healthy and productive, and healthy plants support the life above ground from pollinators to humans to the entire natural world.

Back to dirt. A vast majority of US homes have unintentionally reduced their soil to dirt, due to the practice of applying synthetic fertilizers and pesticides that smother the natural life that would otherwise be in great abundance. Dr. Ingham's description of the unhealthy current state of affairs versus the healthy soil food web sounds curiously similar to a sci-fi battle of good versus evil. The good is the natural biology of bacteria, fungi, protozoa, and nematodes, the microorganisms aka tiny critter warriors that are found in healthy soil.

The villains: synthetic inputs like fertilizers and pesticides, specifically herbicides and insecticides, battling and killing the natural life that would otherwise be in great abundance. An unfortunate downward cycle is born. Weary microorganisms lose battle after battle. The more the soil dies from toxic inputs, the easier it is for pests, diseases, and weeds to settle into that space thus requiring an ever-increasing amount of inputs to maintain a field or garden. With only a few simple steps and a short amount of recovery time from the toxicity, one can give the critter warriors a chance to create healthy soil in which the natural output is nutrient-complete vitality. A healthy environment can be inexpensive and easily obtained when we let nature do the work for us.

Digging into the Soil Food Web

Soil, with its ability to support all plant life while cleaning the air (through carbon sequestration) and filtering water, to some, is considered the very foundation that supports all life.

According to Dr. Ingham, the most important thing for people to understand is that “soil, as it is, with no amendments, *at all*, contains about 1,000-10,000 years’ worth of nutrients to grow plants – all of them – as long as we have the mechanism in place to get those nutrients from that *not*-plant-available form into a plant-available-form,” or simply stated from the *soil to the plant*. Dr. Ingham, through decades of research and hundreds of scientific papers confirms there is absolutely no reason to put inorganic fertilizers on your soil. “It’s a waste of money, and you’re giving money away to something that is not a very charitable foundation – chemical companies.”

Dr. Ingham continued on about inorganic amendments,

“We were convinced back at the beginning of the green revolution that putting these inorganic fertilizers in was something we *had* to do. Go back and read the literature, it was no-holds barred, *this is your duty as an American to grow plants using these inorganic fertilizers to assure a food supply for the US*. People who didn’t want to use chemicals were bullied. It was nasty. A lot of social pressure was applied to do the conversion.”

Essentially, once you start using inorganic fertilizers, killing more of the organisms that would otherwise take the nutrients that are already in the soil and turning those nutrients into plant-available form, you get caught in a cycle of dis-ease. Dr. Ingham expounded on this point,

“With each application of an inorganic fertilizer, 50% of the beneficial organisms in the soil are killed, the 2nd application, there are now only 25% of these necessary organisms, 3rd application now down to 12.5%, another application, down to 6% and so on. Because the plant is not getting the balance of the nutrients it requires, it becomes unhealthy. Unhealthy plants attract disease-causing organisms.”

Parasites, pests, and weeds grow better than crop plants in spoiled soil aka dirt. Folks then reach for the pesticides, and round, round, round we go stuck in a trap of perpetual toxic chemicals.

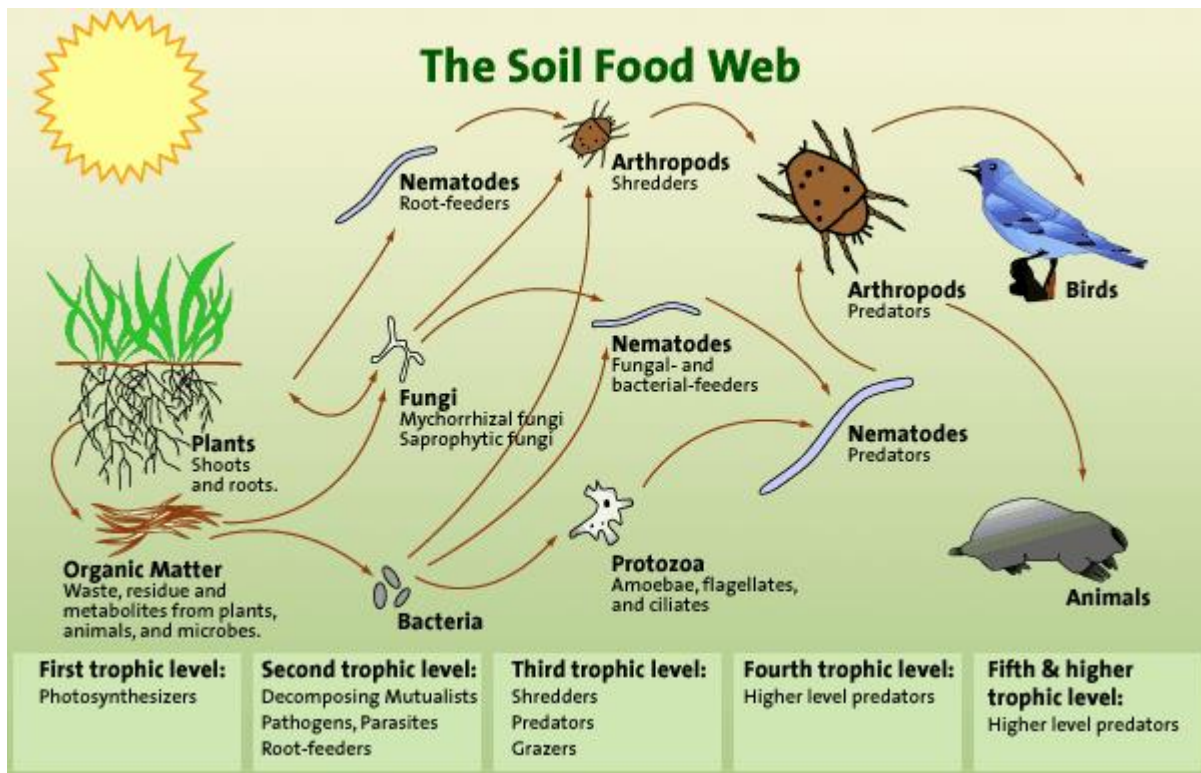
“All of this leaches and creates run-off to our local waterways, our drinking water, and to the oceans. If we keep doing this, there will not be any habitat left for human beings.”

Many homeowners take the toxic route because it seems like the most convenient and cost-effective way to manage their properties. Dr. Ingham enlightened me by sharing that the toxic way is not the most convenient or cost effective method in the long run. Quite the opposite when one factors in the countless health costs from the decline of beneficial insects like our pollinators to diseases our companion animals get walking across a lush, toxic lawn, to our own health costs. Children are more susceptible to physical and neurological diseases when exposed to these toxins, and studies are showing a connection of synthetic pesticides to diseases like Parkinson’s and Alzheimer’s. The risks far outweigh any benefits.

To summarize, the soil food web is the interacting group of organisms in the soil that carry out the following beneficial work for plants:

1. Cycle nutrients into plant available forms from plant *not*-available forms in soil.
2. Compete with, inhibit and consume pests, diseases, parasites.

3. Build soil structure and thus reduce water use, increase water holding in the soil, increase carbon storage, allow air, water and roots to go deep into the soil.
4. Decompose toxic compounds.



What About Pollinators?

The presence of the soil food web is critical for pollinators' health.

“Pollinators are not a whole lot different from human beings. What makes us healthy? It’s the food we eat. If plants don’t have the nutrients in them, then we’re not getting the nutrients we need. We won’t be healthy, we’ll be sick with pests and diseases and will have to take our amendments (drugs or supplements) in order to try and stay healthy, but nothing is ever done in balance.

Go back 200 years ago, people weren’t popping nutrient pills or vitamins. They were just eating a good healthy diet. All the plant materials and animals had the proper balances, because they weren’t destroying their soil.

If we’re eating plant material that has all the right biology, bacteria, fungi, protozoa, and nematodes, they re-inoculate our digestive system so we don’t make that toxic material that gets taken into our blood stream.

Pollinators require two essential components in their habitat: somewhere to nest and reproduce and food – flowers from which to gather nectar and pollen.

So, what’s in pollen and nectar? Carbohydrates (simple sugars), amino acids and protein, lipids (fatty acids, sterols), vitamins, minerals (salts). Where do plants get all that carbon, nitrogen, potassium, sodium, chloride, calcium, magnesium, and so on from? The soil. If there are adequate levels of each of the organism groups in that soil, then those organisms do the work directed by the plant in converting all those *not*-available nutrients in the rocks, sand, silt, and clay into the forms of

those nutrients that plants can take up. And, even better, in the right balances for the plant, and in just the right amounts so no leaching, or loss of nutrients occurs from that soil.

But, what happens if inorganic fertilizers, or pesticides are used? The organisms in the soil that convert *not*-available nutrients into plant-available nutrients are killed, leaving behind disease organisms, pests, parasites and weeds. If the proper life is killed, then inorganic fertilizers and pesticides have to be used to keep the plants alive, except those plants will not be healthy and will not contain the nutrients in the nectar or pollen to keep pollinators healthy. Thus it is critical that the soil food web be present and doing its jobs as directed by the plants growing in that soil.”

Dr. Ingham pointed out an unintended control group: Old growth forests in which there have never been inorganic fertilizers used for more than 1000 years, and the trees grow more rapidly than any crop plant. “It’s a higher production than any agriculture field.”

Is There a Way to Recover from the Abuses of Synthetic Inputs?

If folks stopped using the inorganic fertilizers and pesticides, how long would it take their lawn or property to recover?

The answer may surprise you. Dr. Ingham claimed it would only take one to two months to recover using biological *inocula*, which is a fancy term for *compost*. Specifically, properly made compost where it remains aerobic throughout the whole composting operation. One can also use compost extract or tea and spray it directly on a lawn, in vegetable boxes, or on the soil before sod is placed. Because the plants are putting the roots into that material where the bacteria, fungi, protozoa, and nematodes are building structure, the roots will go deeper into the soil faster. This, in turn, will necessitate less watering, which will save even more money...

... If your compost extract has the following concentrations or higher, you’re in good shape, and you’ll start seeing the results Dr. Ingham talking about.

- Bacteria are above 300 micrograms of bacteria per milliliter
- Fungi about the same as the bacteria – above 300 micrograms per milliliter
- More than 10,000 of the good protozoa (flagellants and amoebae)
- Not many ciliates – less than 25 ciliates
- A couple of bacterial-feeding nematodes and fungal-feeding nematodes.

“Soil can be made overnight by putting the proper biology and the proper organic matter back into the ground. It’s not a 100-year process like some may think. The organisms will get in there and will start building structure that starts wiping out the diseases and pests and problem organisms, so you don’t have to suffer through aphids and fruit flies and all kinds of bugs that skeletonize your leaf material, you won’t have to deal with mildew, fusarium, or crown rot or other fungal diseases – it’s just not necessary. But we’ve got to get the nutrients back into the plant, properly balanced, and they have to stop struggling to get those nutrients in the proper form.” This is what the food web does.

Is There Hope in this Toxic World?

Dr. Ingham is optimistic that, yes, absolutely, there is hope. “We don’t have everything perfect yet, but do we have to strive for perfection? Nature isn’t perfect. So, as long as we start putting the proper sets of microorganisms, the aerobic organisms back out, the ones that were with the plant – that follow the directions of the plant – we could rapidly and very quickly turn things around. ...