GARDENING WITH LIVE CREATURES

Jeff Lowenfels and Wayne Lewis in *Teaming with Microbes: a gardener's guide to the soil food web, (196pp, Timber Press, 2006)* suggest that we shouldn't treat our lawns as we do human cancers – by killing everything off and then trying to help the weakened body (or lawn) recover. It's simply too much work. Once we've used pesticides, herbicides and inorganic fertilizers to create the perfect lawn, we've created an addict, into which we must pump chemicals perpetually. And the same goes for gardens and ornamental beds.

So instead, feed the immune system – the soil's food web – and let it do the work for you.

To help us understand this, they describe life in the soil and how it functions, teach us to manipulate that wonderfully balanced system, and try to convince us why it's worthwhile to do so.

If you think dirt is a dead zone, you're partly right. Much of it does consist of once-living plants and animals. But listen to where those come from: 1 acre of good garden soil can harbor 2 pounds of mammals, 133 pounds of protozoa, 900 pounds each of earthworms, arthropods (bugs) and algae, 2,000 pounds of bacteria and 2,400 pounds of fungi. With enough food, one bacterium can divide to create 5 billion more in 12 hours. Fungi and nematodes (tiny worms) are "the second most dominant form of animal life next to the arthropods." Arthropods make up three-quarters of all organisms, though both nematodes and protozoa exceed them in weight. Two to three million earthworms can inhabit this same acre, moving 18 tons of soil annually.

And how does the soil benefit from all this? Through "decompaction, aeration, better water retention and drainage, and increased retention and availability of nutrients."

Here's how it works: through photosynthesis plants create foods (sugars, etc.) in the form of lures called "exudates" at their roots and leaves that attract bacteria and fungi. Arthropods and other larger creatures eat these, making their stored energy available to the plants. The stickiness of both bacteria and fungi helps give the soil structure; the arthropods and others help aerate it. The goal is "complete digestion of soil matter."

And, apart from entropy, it's self-perpetuating, requiring only soil, water, sun, plants, organic food for the soil web's creatures, and other creatures to eat them.

To manipulate the food web – in order to grow healthy crops and ornamentals without chemicals – we need to know that long-lived plants – trees, shrubs, perennials – grow best in acidic, fungally dominant soils. Annuals – including most vegetables – prefer slightly alkaline, bacterially laced soils. This is partly because fungi are better at digesting lignin, associated with woody plants, and bacteria at digesting cellulose, the softer tissue of annuals.

We can give plants all they need, the authors say, using compost, mulches and actively aerated compost tea. When "brown" materials, such as newspapers, fallen leaves, and straw, dominate compost, fungi thrive; when "green" – grass clippings, kitchen scraps, and so forth – bacteria dominate. And the same with mulches – brown, unless finely shredded or worked into the surface – will be fungally dominant; green will favor bacteria. Fungi like dry mulch, bacteria, wet. So mulch long-lived plants with wood chips or fallen leaves, annuals with, for instance, fresh-cut grass clippings.

Compost tea can jumpstart the activity of the soil food web since it contains, in high concentration, the bacteria and fungi necessary to begin delivering nutrients to plants. To get fungally dominant tea (for perennials), use fungally dominated compost. Ditto for bacterially dominant tea. You get "actively aerated" compost tea using finished compost in pure water with a bubbler – an aquarium pump, for instance. The aeration assures quick, live, sweet-smelling tea. The authors give instructions for brewing and applying it, using equipment most householders can come by readily and cheaply, though some of the additives to tweak the fungal/bacterial balance may not be in everyone's cupboard.

But how can you tell what shape your lawn and garden are in now? The authors describe several simple tests, though none simpler than watching for birds pulling worms: if you see that frequently, you're probably in good shape, since abundant worms mean there's plenty of breeding and eating going on in the soil web around them to provide fodder. And if you don't, they suggest some quick remedies.

So wean yourself from the rototiller (it destroys the soil food web) and avoid nitrogen fertilizers, which quickly flush out of the soil, kill natural nitrogen-containing organisms and encourage weeds. Find natural substitutes for pesticides and herbicides --vinegar, heat, boiling water, corn gluten, or blasts from your garden hose. Leave grass clippings on the lawn or pile them around annual beds. Compost your kitchen scraps and garden waste. Become a compost tea brewer and a mulcher. Then you'll be teaming with microbes, and they'll soon be teeming in your soil.

-- Bill Keep