INTRODUCTION

WORMS AT WORK discusses the vital role most worms play in soil health, soil fertility, and the longevity of ecosystems. It encompasses the important roles worms play in food production and the reasons every gardener should have both a compost bin and a vermicompost bin to help increase resilience and decrease reliance on toxic synthetic fertilizers. It also discusses the aspect of low- to no-budget gardening. *Worms at Work* gives practical instruction on how to create and maintain a home or school vermicompost bin, including a plethora of resources in the form of worksheets, lesson plans, observation records, coloring sheets, and a whole slew of activities revolving around the worm bin that could integrate vermiculture into the science curriculum in both the classroom and homeschool setting. It also provides detailed instruction on how to build and maintain vermicomposting bins for the backyard setting. It discusses how to harvest and store worm castings and the various garden applications in which worm castings could benefit plant growth and health. Chapter 8 discusses how to share worms and knowledge for the greater good of the community.

Vermicomposting and organic gardening go hand in hand. Organic is better for the environment! Humans had been growing organically up until the 20th century, when chemicals developed in the wake of the two world wars led to the "Green Revolution." The

Green Revolution was not actually very green, and unfortunately these new growing methods, which quickly became the norm in industrialized nations worldwide, led to a devastating loss of healthy topsoil that had been built up over millennia. Pesticides, herbicides, and fungicides (etc.) contaminate our groundwater with toxins that are harmful to the soil, the water, and our bodies, especially for children who are particularly vulnerable to toxic exposures.

The Earth's surface is composed of approximately 30% land and 70% water. Soil forms on the land surface and plays a crucial role in supporting life on Earth. Think of the soil as a blanket covering the Earth's land surface, home to billions of organisms, all part of a symphony orchestra that gives rise to life. These tiny unseen organisms assist in soil formation that allows forests to grow and provide structure and nutrients for shrubs, grasses, wildflowers, fungi, lichens, and moss to grow. The soil is the foundation for life on Earth. It is here that life forms, where flora and fauna thrive, where complex interdependent relationships occur. Soil provides the framework to the mycelium sheath, the network of mycelium that allow for plant communication, nutrient uptake, and ultimately new soil formation.

Permaculturist Aaron Jerad describes bacteria as "the smallest but most abundant member of the soil food web. Often feared but essential, whether directly or indirectly, for the survival of almost all other living organisms on earth."

While there are thousands of different soils in the world, their existence is dwindling due to development, monoculture, erosion, clear-cutting, and fracking, among others. Monoculture is the production of single crops over large amounts of acreage that leads to the increased usage of pesticides and herbicides. Farmers who grow these crops are often subject to signing a contract to purchase genetically modified (GMO) seed and the chemicals that accompany them. This leads to various major problems, including contamination of soil and water, erosion, a decrease in soil life, a decrease in biodiversity on that land, and over time, complete degradation of the

once fertile land, the flora, and the fauna. Unfortunately, the damage done by these types of farms has already caused a great deal of irreversible destruction to the environment. Fortunately, there are many large-scale farmers who are transitioning to no-till methods, more humane treatment of animals, pesticide-free growing methods, and smaller-scale operations. Joel Salatin has been planting the way by offering practical advice for farmers who wish to make the transition from conventional farming to no-till farming.

Since the end result of vermicomposting is to have affordable natural fertilizer to give nutrients to your garden, it makes sense to talk about growing food first. The idea of "local foods" began nearly one million years ago with the first hunters and gatherers eating only what they could find in a 100-mile radius. It is only through the globalization of trade and the development of food industry technologies that the concept of local foods was lost to most of us. The modern local foods movement peaked during the victory garden days of World War I and II when canning and preserving fruits and vegetables was the citizen's duty to reduce pressure on the public food supply during wartime. It took a long hiatus postwar through the industrialization of mass food production prompted by the modernization of large-scale farming and the introduction of chemical fertilizers and pesticides and inevitably the growth of grocery store chains in the 1950s. Coincidently, the so-called Green Revolution spawned from the development and production of war chemicals.

While the Green Revolution may have begun as a way to help with starvation, it evolved into something far from it. Wouldn't it have been easier to pass laws making it necessary for people nationwide to have access to a spot for growing their own food? For over five decades, junk food, convenience foods, and prepackaged meals made their way onto kitchen tables around the world, and unfortunately that trend only grows as everyone gets busier. Gardens were replaced with lawns. Real fruit was replaced with artificially flavored vacuum-packed fruit cups swimming in syrup. Home-cooked meals were replaced with Hamburger Helper.

Today, the local foods movement is back. Gardening and self-sufficiency are making a comeback, and we are, in essence, getting back to our roots. While local foods may be slightly more expensive, it helps to think of it in terms of spending a few extra dollars per week to reduce our overall healthcare costs and to improve the well-being of the environment. Local foods grown without pesticides help to improve our health and are a viable form of preventative healthcare. Additionally, purchasing sustainably grown food contributes to the future of the planet. Localized food systems significantly reduce the carbon footprint by cutting back on the number of miles that food travels. They also circulate funds back into the local economy. There are plenty of farmers markets around the country that accept SNAP (Supplemental Nutrition Assistance Program) benefits or food stamps, expanding access for low-income families. Locavores on a budget can join CSA (community supported agriculture) farms and supplement with their own backyard garden. The rise of food awareness is paramount for our growth as a healthy, sustainable community. Seeing the world from the potato's-eye view makes us firm believers in the local foods movement as a remedy for the global food crisis.

By teaching and empowering others, especially youth, to grow their own food, we provide them with a sense of purpose, accomplishment, and responsibility. By encouraging them to source food locally, we instill in them a sense of community that fosters respect and commitment and provides a stepping-stone for them to tackle other pressing environmental concerns, such as deforestation, global climate change, air and water quality, natural gas fracking, and exploitative extractive industries.

Good food requires good soil. Good soil requires worms and a variety of other soil-dwelling organisms and microorganisms to sprout life from the soil.

Soil has been labeled as a nonrenewable resource by many scientists, and therefore, measures must be taken to ensure that the soil that is left on Earth will be preserved and held with reverence. In

an article in *TIME Magazine* (December 14, 2012), Professor John Crawford of the University of Sydney estimates that in 60 years the topsoil will be depleted:

> Some 40% of soil used for agriculture around the world is classed as either degraded or seriously degraded, meaning that 70% of the topsoil, the layer allowing plants to grow, is gone. Because of various farming methods that strip the soil of carbon and make it less robust as well as weaker in nutrients, soil is being lost between 10 and 40 times the rate at which it can be naturally replenished.

Further, he concludes that "microbes need carbon for food, but carbon is being lost from the soil in a number of ways — overploughing, the misuse of certain fertilizers, and overgrazing."

If these problems are not immediately addressed, Crawford states there are two major issues of concern. First he predicts the loss of soil productivity will result in a 30% decrease in food production over the next 20 to 50 years. Second, he fears water will reach a crisis point, an issue that is causing conflict all over the world. This is bad news.

The best efforts the human race can make are to:

- Stop relying on big agriculture for our food supply. This means altering our diets to eat with the seasons.
- Support your local farmers: Join a CSA. Shop at the local grocer or farmers markets. Join a co-op or buying club to source local meats, fruits, veggies, eggs, dairy, etc.
- Grow your own fruits, vegetables, and herbs and practice soil-building techniques in the process.
- Leave the soil better than you found it.

- Educate others in your community about the importance of soil building — for the health of the environment, air and water quality, for the health of all life on Earth from the tiny microscopic organisms beneath our feet to insects, reptiles, amphibians, birds, mammals, and humans.
- Become an advocate in your community. Get involved in ways to prevent the depletion of nonrenewable resources.
- Participate in river cleanups and litter cleanups.

For nearly a decade, my husband Eric Stevens and I have been growing food for our community, always using organic methods. For smaller gardens that we have installed, we have used no-till methods. From 2010 to 2016, we co-managed a CSA farm, operating on a shoestring budget that forced us to find creative solutions to issues such as soil fertility, plant health, and increasing crop yields.

We built the vermicompost bins upon our arrival at La Vista. While we did use tillers and tractor implements, we tried to remediate the soil by practicing crop rotation, adding cover crops, compost, straw, leaf mulch, and other organic materials. We used vermicompost (often with worms still in it) to fertilize our crops with living microbes and nutrients, side-dressing each plant in the field with a scoop to give them a jumpstart and facilitate growth and plant vitality.

Fastening three pallets together, we started with a single compost bin under a shade tree. We filled it with straw, fallen leaves, grass clippings, food scraps, shredded cardboard, torn strips of newspaper, as well as small branches and twigs to provide air spaces. We turned the compost a few times and let it sit for a few days. We then purchased a bag of mail-order red wriggler worms from an ad in *Mother Earth News*. After making a little hole in the bin by pushing away some of the compost, we added the worms. Our son got to

help, and boy, was that such a neat experience to watch a young little lad holding a hundred worms in his hands. His eyes lit up, and he didn't want to put them in the bin. He wanted to bring them home. But we told him the vital role that worms play and how much they will love their new home, which made it a little easier to say farewell to the worms for now, with the promise that he could visit them each day.

Since my son started at the local Montessori school, I have been teaching gardening lessons there as well as a garden summer camp. The children are so fascinated by the miraculous seed-to-table process, the excitement of planting, harvesting, and saving seed. But nothing seems to strike their interest more than worms and their role in food production and creating soil. Children love gardening and in turn are curious about the food they harvest. Children who garden tend to love vegetables.

Each of us can play a role in building healthy soils. Whether through backyard gardening, composting, vermicomposting, permaculture, adding mycelium to the soil, adding soil amendments, practicing regenerative soil building techniques — every bit helps. On a larger scale, adding cover crops, practicing polyculture and biodynamic farming techniques, and implementing large-scale permaculture methods are good places to start.

After adding the worms seven years ago, we have seen them multiply by the thousands. We have been separating them out and adding them to new piles or giving them away at talks ever since. We have been teaching Vermiculture 101 workshops for several years. We love presenting the Vermiculture 101 workshop as well as the Family Adventures in Vermiculture at the Mother Earth News fairs, across the country; (which happen several times each year). We have no formal degree in the subject matter, so please know that everyone approaches vermicomposting a little bit differently. Our passion for Earth stewardship fuels our drive to want to share the knowledge.

1

A GOOD GARDEN BEGINS WITH HEALTHY SOIL

COMPOST: A GARDENER'S MOST VALUABLE RESOURCE

Avid gardeners are fully aware of the importance of compost. We have seen the enormous difference that it makes on crops such as tomatoes, eggplant, and peppers. We have done experiments planting two rows of identical crops: one row with compost added and one without. The crop with compost doubled in size within just a few short weeks. Most gardeners will talk as long as you let them about their prized compost pile. It is often life-altering when the newbie gardener comes to the exciting realization that over half of their waste can simply be thrown into a bin in a corner of the yard and over time breaks down into the most nutrient rich soil. The concept becomes even more fascinating when observing the similarities between what was happening in my compost bin and what was happening in nature. The typical newbie gardener usually throws all of the veggie ends and recycled brown paper bags in the compost bin and forgets about it for months. When they return, they discover the "black gold."

Ideally, all of our garden beds would be exactly like a compost bin, alive with various layers gently breaking down with no compaction. Building healthy soil is the key to having optimal health in any

garden setting. In can be thought of in terms of building the soil's immune system to help fight off unwanted diseases or pests. As non-certified organic CSA farmers, we are often asked questions such as "How do you build healthy soil?" and "What can I add to my soil to make it organic?" Our answer is based on the same concept every time: The soil is a living organism covering the Earth's surface. Like all living things, it needs to be fed proper nutrients to thrive.

It is important to discuss some key elements.

NITROGEN FIXATION AND CARBON SEQUESTERING

Christine Jones, in a *Permaculture News* article (October 2014) stated:

> Nitrogen is a component of protein and DNA and as such, is essential to all living things. Prior to the Industrial Revolution, around 97% of the nitrogen supporting life on earth was fixed biologically. Over the last century, intensification of farming, coupled with a lack of understanding of soil microbial communities, has resulted in reduced biological activity and an increased application of industrially produced forms of nitrogen to agricultural land. Despite its abundance in the atmosphere, nitrogen is frequently the most limiting element for plants. There is a *reason* for this. Carbon, essential to photosynthesis and soil function, occurs as a trace gas, carbon dioxide, currently comprising 0.04% of the atmosphere. The most efficient way to transform carbon dioxide to stable organic soil complexes (containing both C and N) is via the liquid carbon pathway. The requirement for biologically fixed nitrogen drives this process. If plants were able to access nitrogen directly from the atmosphere, their growth would be impeded by the absence of carbon-rich topsoil. We are witnessing an analogous situation in agriculture

today. When inorganic nitrogen is provided, the supply of carbon to associative nitrogen-fixing microbes is inhibited, resulting in carbon-depleted soils. Aggregation is the key. Aggregates are the small "lumps" in soil that provide tilth, porosity and water-holding capacity. Unless soils are actively aggregating, they will not be fixing significant amounts of atmospheric N or sequestering stable forms of carbon. All three functions (aggregation, biological N-fixation and stable C-sequestration) are inter-dependent. The microbes involved in the formation of soil aggregates require an energy source. This energy initially comes from the sun. In the miracle of photosynthesis, green plants transform light energy, water and carbon dioxide into biochemical energy, which is transferred to soil as liquid carbon via an intricate network of mycorrhizal fungi and associated bacteria. Biological nitrogen fixation is the key driver of the nitrogen and carbon cycles in all natural ecosystems, both on land and in water. When managed appropriately, biological nitrogen fixation can also be the major determinant of the productivity of agricultural land. Many farmers around the world are discovering first-hand how the change from bare fallows to biodiverse year-long green, coupled with appropriate livestock management and reduced applications of inorganic nitrogen, can restore natural topsoil fertility. Improving soil function delivers benefits both on-farm and to the wider environment.

The nitrogen cycle is defined by *Encyclopedia Britannica* as the circulation of nitrogen in various forms through nature.

Nitrogen, a component of proteins and nucleic acids, is essential to life on Earth. Although 78 percent by volume of the atmosphere is nitrogen gas, this abundant reservoir exists in a form unusable

▲ Carbon sequestration. Credit: www.resilience.org/stories/2015-09-02/why-not-start-today-backyard-carbon-sequestration-is-something-nearly-everyone-can-do/

by most organisms. Through a series of microbial transformations, however, nitrogen is made available to plants, which in turn ultimately sustain all animal life. The steps, which are not altogether sequential, fall into the following classifications: nitrogen fixation, nitrogen assimilation, ammonification, nitrification, and denitrification.

Nitrogen fixation, in which nitrogen gas is converted into inorganic nitrogen compounds, is mostly (90 percent) accomplished by certain bacteria and blue-green algae (*see* nitrogen fixation). A

▲ Practicing organic and regenerative farming techniques can help to remedy some of these problems. Planting nitrogen fixing trees, plants and cover crops are a good place to start.

much smaller amount of free nitrogen is fixed by abiotic means (e.g., lightning, ultraviolet radiation, electrical equipment) and by conversion to ammonia through the Haber-Bosch process.

Nitrates and ammonia resulting from nitrogen fixation are assimilated into the specific tissue compounds of algae and higher plants. Animals then ingest these algae and plants, converting them into their own body compounds.

The remains of all living things—and their waste products—are decomposed by microorganisms in the process of ammonification, which yields ammonia. (Under anaerobic, or oxygen-free, conditions foul-smelling putrefactive products may appear, but they too

are converted to ammonia in time.) Ammonia can leave the soil or be converted into other nitrogen compounds, depending in part on soil conditions.

Nitrification, a process carried out by nitrifying bacteria, transforms soil ammonia into nitrates, which plants can incorporate into their own tissues.

Nitrates also are metabolized by denitrifying bacteria, which are especially active in water-logged, anaerobic soils. The action of these bacteria tends to deplete soil nitrates, forming free atmospheric nitrogen.

According to Adrian Ayres Fisher, in an *Ecological Gardening* article (September 2015), "carbon sequestration, or pulling carbon out of the air and storing it deep in the ground, as noted environmental journalist Elizabeth Kolbert points out in a recent article, no one knows how to do this."

However, this is not precisely true, though in a modern technological sense of course it is. Anyone who owns or rents a little land on which plants grow can, him or herself, sequester carbon, and may even be doing so at this very moment without even realizing it. It's not hard. Healthy soil does this naturally. All we have to do is help nature along. And as we do so, we can help improve ecosystems, improve soil fertility, and even help endangered species survive. Regenerative farmers and ranchers are doing this in a big way all over the world, though the ones I'm most familiar with are working in the US, in places like North Dakota, Illinois and Minnesota. Even though farming and gardening practice has usually, seemingly inevitably, depleted the soil, scientists such as R. Lal, Christine

▲ It is important to teach future farmers the importance of soil health and land stewardship.

Jones, Michelle Wander, Michel Cavigelli and others, as well as entities such as the Rodale Institute, have shown that regenerative techniques actually rejuvenate the soil and sequester carbon. And, not only is their, and others', long-term research showing how and why this works, but scientists are also teaming up with farmers to demonstrate and study practical techniques—and even conducting classes to teach farmers soil conservation methods. This is vitally important work, since agriculture and other domestic land management is responsible for something like 30% of greenhouse

gas emissions worldwide. The key is to help soil store more carbon than is released, while at the same time encouraging nitrogen fixation and general nutrient production. Unfortunately, a number of standard farming and gardening practices prevent these desirable processes.

Here are some actions that each of us can take in our own yards:

- Do not use synthetic fertilizers, pesticides, herbicides, fungicides, insecticides, or other inorganic sprays.
- Reduce the size of your lawn by planting native species and participating in ecological restoration.
- Over-seed lawns with Dutch white clover.
- Don't rake leaves: allow them to decompose, help build soil, and store carbon.
- Use regenerative farming and gardening practices.
- Plant nitrogen-fixing leguminous living mulches between vegetable rows.

COMPOSTING IS AN EXAMPLE OF BIOMIMICRY

The Biomimicry Institute defines *biomimicry* as "an approach to innovation that seeks sustainable solutions to human challenges by emulating nature's time tested patterns and strategies." According to the Regenerative Leadership Institute:

Composting also is an example of biomimicry, which is the process of trying to mimic natural biological systems. Composting speeds the process exhibited in the woods: plant material falls to

the ground; it weathers and breaks down; and some of it provides benefit for the soil while other components promote the growth of totally different plants.

Good garden soil is essentially a larger version of a compost pile, ideally composed of ongoing layers of the following:

- Small stems and twigs
- Collapsed leaves
- Grass clippings
- Compost
- Worm castings
- Aged sawdust (untreated)
- Living organisms
- Fruit and vegetable scraps
- Other organic matter

Vermiculture is the term given to worm farming, or the use of worms to break down organic material. *Vermicompost,* or worm compost, is a nutrient-rich natural fertilizer. It is similar to compost, but uses worms such as red wigglers and earthworms to help break down organic material. Red wigglers can be purchased at a bait shop, online, or through mail order.

Vermicompost, which is rich in nitrogen, phosphorus, and potassium, also contains macronutrients and micronutrients, which all benefit plant health and stimulate growth. It also adds nutrient-rich minerals back into the soil. Vermicompost can be made into a nutrient-rich tea to water garden plants. We use one part vermicompost to ten parts water. Simply fill a burlap sack, potato sack, or mesh bag with

vermicompost. Place the sack in a large bin such as a Rubbermaid container or 55-gallon drum. Fill with water. Steep the bag for a minimum of one day and a maximum of one week.

Worm castings are the final by-product of vermicompost; essentially they are the aggregate, dark brown rich soil medium found at the bottom of the vermicompost bin. They can be added to a seed-starting soil mixture or used to top-dress seedlings in pots and to side-dress larger transplants in a garden bed or field. Worm castings can also be sprinkled on top of small garden beds.

A GOOD GARDEN BEGINS WITH HEALTHY SOIL

Building healthy soil is the key to having optimal health in any garden setting. Building the soil structure is crucial in the role of fighting off diseases or pests.

While there are thousands of different soils worldwide, their existence is dwindling due to development, monoculture, erosion, the overuse of herbicides and pesticides, and the overall mistreatment of soils. Because soil is a nonrenewable resource, it must be held with reverence. If we don't stand up for it, we will see more and more of the devastating effects of soil degradation in our lifetime.

We need the soil. Soil provides the framework for life on land. It provides structure for forests and a growing medium for food production. Some of the best ways that each of us can contribute to solutions to healthier soil begin with food. Grow your own by practicing backyard permaculture. Localize food systems by supporting area farmers who practice regenerative growing practices. Buy less. Support renewable energy. Plant native flowers, shrubs, and trees. There are so many things we can be doing for the Earth during our short time here to ensure that our children and grandchildren have access to clean air, clean water, and fertile soil to grow their food.

PREPARED FOR: ERIC STEVENS GODFREY IL											
SAMPLE ID	ANALYSIS DATE	ORGANIC MATTER	CATION EXCHANGE CAPACITY CEC MEQ/100G	PERCENT BASE SATURATION (COMPUTED)					SOIL PH	POTASSIUM	MAGNESIUM
				% K (+)	% MG (+)	% CA (+)	% H (+)	% NA (+)		K (+) PPM	MG (+) PPM
1 front	02-16-12	1.6	7.4	3.9	14.5	80.7		0.9	7.2	112	129
Desired Level				3-5	12-16	70-75			6.8	87-144	107-142
1 back	02-16-12	1.7	8.9	5.2	17.0	77.1		0.7	7.4	181	182
Desired Level				3-5	12-16	70-75			6.8	104-174	128-171
GR House	02-16-12	4.3	19.1	5.1	24.7	67.6		2.6	7.4	383	565
Desired Level				3-5	12-16	70-75			6.8	223-372	275-367
SM Garden	02-16-12	2.4	14.7	5.1	18.3	76.0		0.6	7.7	290	322
Desired Level				3-5	12-16	70-75			6.8	172-287	212-282
2 Backleft	02-16-12	1.7	10.2	2.8	17.3	79.1		0.6	7.5	110	212
Desired Level				3-5	12-16	70-75			6.8	119-199	147-196
2 Backright	02-16-12	1.6	8.9	3.5	17.7	78.2		0.6	7.5	122	189
Desired Level				3-5	12-16	70-75			6.8	104-174	128-171
2 Front	02-16-12	1.6	8.7	4.1	16.2	79.1		0.6	7.4	140	169
Desired Level				3-5	12-16	70-75			6.8	102-170	125-167

▲ An example of soil test results.

- Soil-building techniques can be easily implemented in backyard gardens.
- Ditch the pesticides and herbicides.
- Consider backyard chickens or other livestock.
- Each of us can play a role in building healthy soils.

SOIL QUALITY

Quality soil is the most vital aspect of growing organically! A healthy living soil is the key to vibrant and healthy plants. Compost,

						MICRONUTRIENTS				
CALCIUM	SODIUM	PHOSPHORUS			SULFUR	ZINC	MANGA-NESE	IRON	COPPER	BORON
CA (+) PPM	NA (+) PPM	P1 (WEAK BRAY 1:7) (–) PPM	P2 (STRONG BRAY 1:7) (–) PPM	BICARB (OLSON) (–) PPM	S (ICAP) (–) PPM	ZN (+) PPM	MN (+) PPM	FE (+) PPM	CU (+) PPM	B (–) PPM
1190	15	30	39	–	8	3.1	15	34	0.8	0.4
1036–1110		25–50	50–100	33	50	5.0	20	20	5.0	2.0
1366	14	42	76	–	9	3.4	14	29	0.9	0.4
1246–1335		25–50	50–100	33	50	5.0	20	20	5.0	2.0
2579	113	159	160	–	170	7.7	11	52	1.4	1.4
2674–2865		25–50	50–100	33	50	5.0	20	20	5.0	2.0
2233	21	109	116	–	9	9.0	7	42	1.3	0.9
		25–50	50–100	33	50	5.0	20	20	5.0	2.0
1621	18	37	56	–	7	4.1	6	31	0.9	0.6
		25–50	50–100	33	50	5.0	20	20	5.0	2.0
1392	12	43	57	–	7	3.4	6	30	0.8	0.5
		25–50	50–100	33	50	5.0	20	20	5.0	2.0
1374	12	49	98	–	6	4.3	7	29	0.9	0.5
		25–50	50–100	33	50	5.0	20	20	5.0	2.0

vermicompost, and other organic soil add nutrients to your soil, improving plant vitality.

All soils are different. A soil analysis or test is a good starting point to determine what nutrients might be lacking and to understand better the composition and personality of your soil. Soil agronomists offer soil analyses. Typically, they collect and analyze samples from multiple quadrants of your field or farm to determine your soil types and which minerals and trace minerals are abundant or lacking. Most soil agronomists also offer custom natural fertilizers that are OMRI (Organic Materials Review Institute) certified, based on test results.

▲ Nature is a good model to follow.

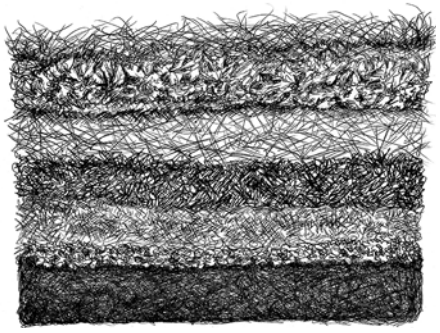
NATURE IS A GOOD MODEL TO FOLLOW

We like to encourage individuals to look at nature, to *really* look.

- Observe the forest floor up close.
- Notice the layers of fallen trees, branches, leaves, twigs, moss, fungi, and other detritus materials all decaying at various rates.
- You will notice the top layer has the appearance of basic mulch.
- Scratch the surface and you will notice the layers below get broken down inch by inch into perfect soil.

- We strive to obtain those rich qualities in the soil by mimicking those natural layers in the substances we add to our own garden soil.

Ideally, all of our garden beds would be exactly like a compost bin, alive with various layers gently breaking down with no compaction. The soil is a living organism covering the Earth's surface. Like all living things, it needs to be fed proper nutrients to thrive.



▲ Layers in the compost pile.

To recap, ideal garden soil is composed of ongoing layers of the following:

- Small stems and twigs
- Fallen leaves
- Grass clippings
- Compost
- Worm castings
- Aged sawdust (untreated)
- Living organisms
- Fruit and vegetable scraps
- Other organic matter