Soil is Alive!



by Jon Stika, illustrated by Eve Stika

Soil is not just little bits of sand, silt and clay with some old dead plants mixed in. A healthy soil is alive with many living things, most of them too small for us to see with only our eyes. There are more living things in a lump of healthy soil the size of your big toe than there are people on Earth right now... over 7 billion of them!

When you are healthy, all of the parts of your body work as they should so you can do your best. A healthy soil must also work at its best if we expect it to grow our food. A healthy soil will feed and hold water for the plants that grow in it. To be a good home for plants, the soil must also be a good home for all of the things that live in it.



A plant uses energy from the Sun to make sugar that it uses to "buy" food from soil organisms.

Besides large things, like insects and earthworms, there are also very tiny things that live in the soil called microorganisms. "Micro" means very small. "Organism" means a thing that is alive. It is these microorganisms and other things that live in the soil that keep the soil and plants healthy.

The soil should have a balance among all the things that live in it. There should be many different kinds of organisms in a healthy soil. This is called biodiversity. "Bio" means life and "diversity" means many kinds of things in one place. To keep soil alive, we must protect soil biodiversity. We can do this by caring for the soil properly.

A wide variety of organisms in the soil is not only important for living plants, but to also break down dead plants. All of the dead leaves and stems of plants are called residues. Dead plants need to be broken down so they can become food for new plants. No one creature in the soil does the entire job of breaking down plant residues. This is why it is important to have many different kinds of organisms in the soil. Having good biodiversity in the soil helps turn old plant residues into food for new plants.

It is all of the living things in the soil that makes it able to do the things that we expect soil to do. In this way, soil is truly a living system, not just dirt. Dirt is dead, soil is alive! As with any living thing, the soil must be healthy to do the things we expect it to do, such as clean our water and grow our food.

There are four basic things we can do to keep the soil healthy:

- 1. Disturb the soil less.
- 2. Increase the different kinds of plants that grow in the soil.
- 3. Keep living plants with their roots in the soil as much of the time as possible.
- 4. Keep the soil covered with plants and/or their residues at all times.

All of these are ways that help make soil healthy and will make it a good home for the things that live in the soil.

Most of the soil where crops have been grown in the past has been damaged. Because of that, we must work to make the soil healthy again. This will mean that we must first change the way we think about soil as a living system. Then, we must change the way we care for the soil. Now, let's take a closer look at the four ways we can make soil healthy.

The first way to make the soil healthy is to not disturb the soil. If you dig up the soil with a shovel or other tool that breaks the soil apart, you are also breaking down the home of the things that live in the soil. Digging or plowing the soil is like an earthquake, a fire, and a bad storm all happening together to ruin the home for soil life.

Breaking the soil into smaller pieces shatters the house that soil life lives in. It also makes the soil hold less food and water for soil life. A soil that is left alone gives the things that live in the soil a stable home. It then can provide them with food and water to keep them healthy.

The next way we can make the soil healthy is to have a wide variety of plants growing in the soil. Just as a village has many different people that do different jobs, so it is true for the village of organisms that live in the soil.

Plants give food to the life in the soil through their roots. The more types of plants we grow in the soil, the more types of food they provide to soil organisms. Just as you need to eat different foods to stay healthy, so does the life in the soil. Growing many different types of plants gives soil organisms a balanced diet.



Living plants and their roots keep the soil healthy

The third way we can make soil healthy is to keep living plant roots in the soil as much of the time as possible. The soil microorganisms are fed by sugars that come out of the roots of living plants. This is the favorite food of soil organisms. Without always having food from living roots to eat, soil life will go to sleep and stop doing the work that is needed to keep the soil healthy. The final way we can keep soil healthy is to keep the soil covered at all times. A cover of living plants and the residues from dead plants is like the roof on a house that protects you from the weather. A soil that is covered by plants and their residues does not get too hot, too cold, too wet, or too dry. It provides a sheltered and safe place for everything that lives under it.



Plants and their residues are like a roof over the soil that protects it from rain and wind

Once we understand that soil is alive and filled with biodiversity, we can change how we treat the soil to help it stay alive and healthy. All of the life in the soil needs food, water and shelter, just as you do. If we do the right things to keep the soil healthy, all of the things that live in the soil will be healthy and able to do their jobs.

As we use the soil to grow our food, we must remember that the soil is a living system of plants and many kinds of large and small organisms. How well these organisms live and work depends on how well we treat the soil.

By using the four ways to make soil healthy, we can be sure that the soil will be able to produce food for us for a very long time. If we do not treat the soil with care, it may one day fail to produce food for us.

Remember, just like us, soil is alive!

Check the health of your soil!

Here are three easy ways you can check the health of your soil:

- 1. Dig a hole and look for signs of life.
- 2. See if the pieces in the soil hold together when it they get wet.
- 3. See if water goes down into the soil when it rains.

Even though it is not good to disturb the soil, it is alright to dig a hole once in a while to check on the life in your soil. Dig a small hole as deep as the blade on the shovel you are using. Be alert, some of the things that live in the soil, such as worms and insects, will often scurry away to hide!



Look at where live plant roots touch the soil, this is the area where most of the microorganisms in the soil live, because that is where the food is! If soil sticks to the roots of living plants that you dig up, it shows that those plants have sugar on their roots and organisms are coming there to eat the sugar.

Use your hands to break the soil into pieces. The soil should break apart easily into small crumbs and cubes. Most things that live in the soil need the small spaces between these many pieces of soil to be able to move around. If the soil stays in a few large hard blocks, or is like powder when you dig, it is not a very good home for soil life.

The next way that we can check on the health of the soil is to see how the soil holds together when it gets wet. This is important because a soil that has small strong pieces will allow water (and air) to flow between those pieces and go deeper into the soil.

To do this test, pick up some of the crumbs or small cubes of soil the size of your thumbnail and put them someplace to dry. Once they are dry, drop one into some water and see how long that piece of soil takes to fall apart. You will see air bubbles coming out of the soil as water moves into it. The longer a piece of soil holds together, the healthier the soil is. A healthy piece of soil will stay together for over one minute.



Plant roots and soil life make lots of sticky things that glue the soil together. If the life in the soil is not healthy, the glue that holds the soil together will be weak. If the life in the soil is well cared for, the glue that holds the soil pieces together will be strong. Strong soil pieces don't fall apart easily and will let water and air move into the soil to keep soil organisms healthy.

One last way to tell if soil is healthy is to see how easily water moves into it when rain falls or we water our plants. You can use an old can with the top and bottom cut out to do this test. Simply put one open end of the can down on the soil and carefully push or tap it part of the way into the soil. It is best to place a small block of wood on top of the can, then tap on it with a hammer or rock to get the can to go down into the soil. Once you have the can about halfway into the soil, gently pour some water in the top of the can to fill it about half full. Then watch to see how long it takes for the water to soak down into the soil. If you have a watch or a timer, you can see how much time it takes for the water to all seep into the soil.



A healthy soil will let water go down into it quickly. An unhealthy soil will only allow water to move down into it very slowly.

References:

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Stika, J. (2016) A Soil Owner's Manual: How to Restore and Maintain Soil Health. Jon Stika. Dickinson, North Dakota.

Soil and Water Conservation Society (2000) Soil Biology Primer. Soil and Water Conservation Society. Ankeny, Iowa. There are many books about how people can try to control the soil to grow food. This book does not tell you how to try and control the soil. Instead it will help you learn how the soil works in its own way. It is intended to teach young students how they can help keep the soil healthy.



The author draws on his lifelong experience with soil as a farmer, dairy herdsman, integrated pest management specialist, gardener, soil scientist, agronomist, cartographer, horticulturalist and soil health instructor to help young people understand what makes the soil work. He is the 2014 recipient of the Legacy of Conservation Award from the Natural Resources Conservation Service, 2014 United States Zero Till Non-Farmer of the Year Award winner from the Manitoba-North Dakota Zero Tillage Farmers Association, 2002 & 2014 Professional Award winner from the North Dakota Association of Soil Conservation Districts and 2006 Fellow Award winner from the Soil & Water Conservation Society for his work in writing and teaching about soil health.