Healthy Soil

Life begets and sustains life

By Keith Maurer

Winter in northern climates means snow, ice and road salt. In the spring, you can tell how severe the winter was based on how much turf and shrub damage is visible. Many centuries ago, winning armies used to spread salt over the land of the vanquished so they could not grow crops. The lesson: salt kills, either quickly or slowly.

Salt, among other things, can make soil unhealthy. Since most of the chemicals we've come to rely on for growing plants, including fertilizers like muriated potash, contain some level of salt, it's no wonder that our soils have become less and less productive. So what is healthy soil? Entire textbooks have been written about soil, so we will just touch on some of the basics.

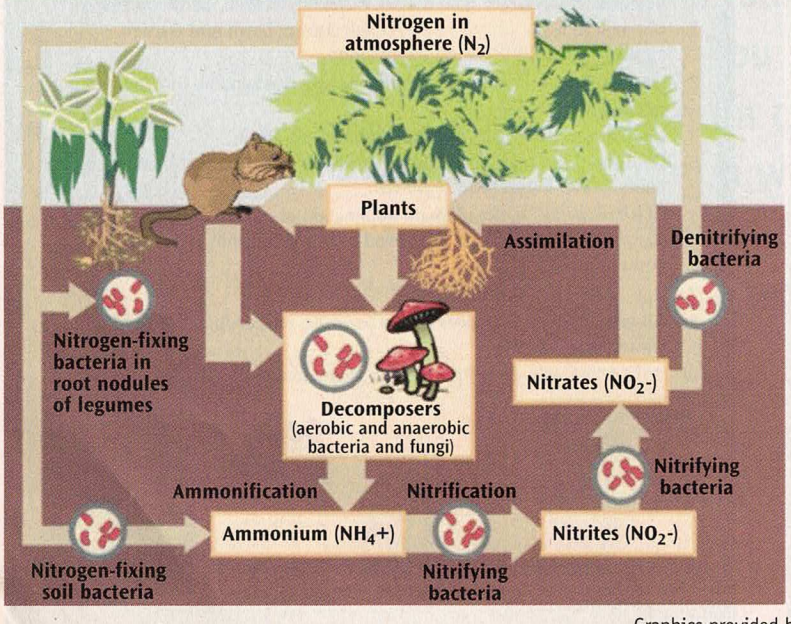
The difference between dirt and soil is life. All of the nutrients in the world cannot turn dirt into soil. It takes biology, everything from single-celled bacteria and fungi up to nematodes, protozoa, earthworms, etc. Healthy soil contains hundreds of millions of tiny creatures per teaspoonful.

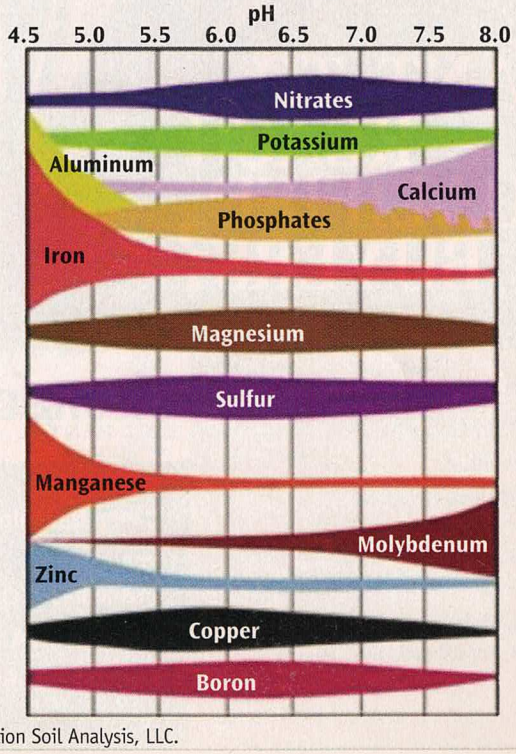
Biology aerates, decomposes plant material, facilitates nutrient uptake (e.g. mycorrhizae), builds soil structure, greatly reduces water needs, and plays a critically important role in nitrogen conversion in the nitrogen cycle.

Healthy soil has 50,000 protozoa per teaspoon. In this same teaspoon of soil, in a single day, these protozoa eat 500 million bacteria and release 400 million molecules of nitrogen.

Of course, nutrients are essential. Nitrogen, phosphorous and potash are not enough and, without all of the nutrients in proper balance, health issues can result.

In addition, pH has a dramatic impact on the utilization of nutrients. As the pH chart shows, the greatest utilization of nutrients takes place when the pH range is between 6.0 and 7.0. Biological activity impacts pH as well.





Graphics provided by Prescription Soil Analysis, LLC.

The message here is that pH is the first issue to test for and correct. Otherwise, any other nutrient management program could be a waste of time and money.

We tend to overlook the micronutrients and their importance. For example, zinc is required for tree bark to stretch without cracking. Without silica, sap cannot move up a tree. Boron is necessary for cell division, strength and development, sugar transport, reproductive activity and hormone development. It is also a necessary co-factor with N, P, K, and Ca. Among calcium's many functions, is its ability to relieve soil compaction. Obviously, a high-quality, comprehensive soil test is required before a professional can begin to develop any type of plant health program.

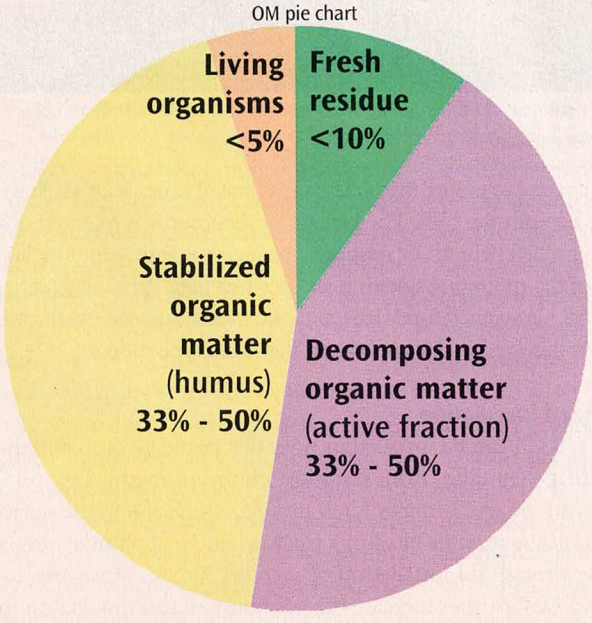
Healthy soil also requires organic matter, which is critical for so many reasons. Organic matter (OM) should comprise a minimum of 5 percent of the soil's volume, but 10 to 15 percent is preferred. Ideally, the amount of OM should be divided into the categories shown in the OM pie chart. Creating OM is a dynamic process that includes living organisms, fresh residue (such as grass clippings), decomposing and stabilized (fully decomposed) organic matter. Some benefits include the following:

- Reduced soil compaction
- Enhanced fertility
- Reduced nutrient leaching
- Reduced soil erosion
- Increased biological activity
- Reduced greenhouse gases due to Carbon Sequestration in the soil
- Increased water retention

Perhaps most important, OM is required to sustain biological life in the soil. The greater the amount of OM, the greater the potential for dynamic biological activity.

We should not overlook the important benefits of carbon sequestration either. OM is defined by its carbon content. High amounts of OM in the soil will absorb carbon dioxide from the atmosphere. If one-third of all residential property in the United States had soil with at least 5 percent OM, it would be equivalent to taking 1 million cars off the highway. Couple this with planting millions of trees, and concerns about excessive atmospheric carbon dioxide would disappear.

OM pie chart



Soil biology, pH, nutrients and organic matter are involved in a dynamic dance, and the synergy within and between each of these broad areas of science is the basis of healthy soil. These dynamics are more complex than we currently understand or may ever completely understand. Soil health is the basis for all plant health and, by extension, the basis for human health. We abuse the soil at our own peril.

On the other hand, no matter how well intentioned, trying to 'fix" the soil by only focusing on one aspect of the science is incomplete at best and may be counter-productive at worst.

As Dr. Alex Shigo continually stressed, arboriculture for the 21st century needs to move beyond the compartmentalized approach to plant health care in favor of a more holistic paradigm that understands and values the relationships and dynamics between the various actors on the stage. And, properly staged, the soil can become a self-sustaining dynamo of life. Remember, no plant, from a giant redwood to a blade of grass, can be any healthier than the soil in which it grows. AA

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