

Soil Structure

Backyard Wisdom - September 2020

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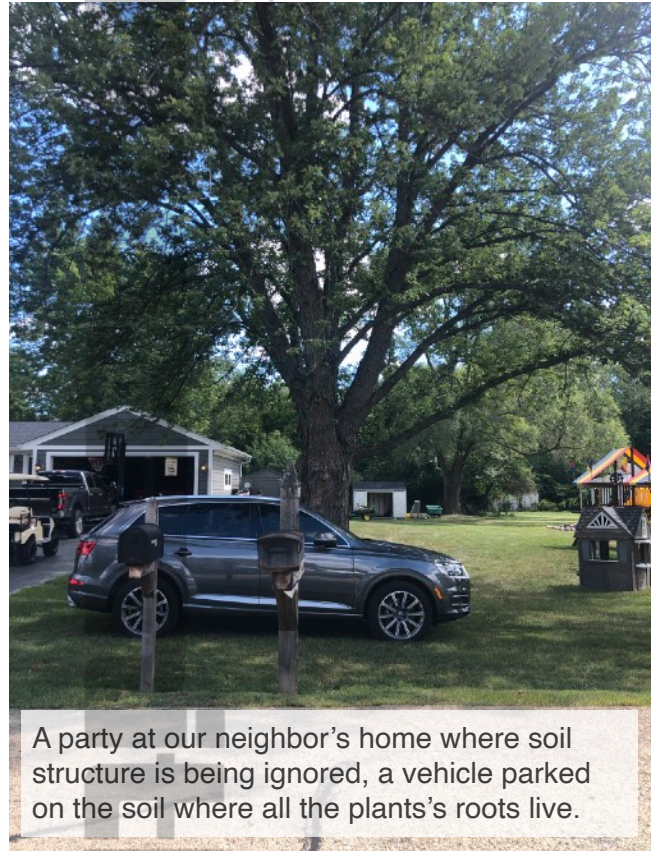
Forty-five years ago in Agronomy class I wondered what was so important about **soil structure**? Those of us in the plant world know that soil is made up of various ratios of sand, silt, clay and organic matter. We can test it for plant essential minerals like, nitrogen, phosphorus, potassium, etc. But what *exactly* is **soil structure** and why is it so important?

Maybe you've seen wet or dirt spots in your yard where grass never seems to take hold and it's always muddy because cars, lawn mowers or people keep it trampled. This is probably a spot where soil structure has been broken down.

In a healthy soil, roughly 50% of the soil volume is comprised of air spaces. These spaces are formed by the way soil particles knit together. **Air spaces are where plant roots live, breathe and drink.** (see last month's article on Too Much Water Killing Trees) This is what makes having a healthy soil structure so important.

About 100 years ago American farmers made the mistake of plowing up native prairie soils which had been healthy and productive for 10,000 years. They destroyed the soil structure making the beautiful topsoil collapse on itself into a hard impermeable layer that resisted water infiltration. The rain then pooled on the surface and ran off carrying the soil with it. It was the perfect storm of: 1) damaging, non contour plowing, 2) the steel plow and tractor making plowing easier, 3) the Great Depression driving crop prices down and 4) a massive drought sweeping the country. My father said that in the 1930s the Chicago skies were blackened by the clouds of soil blowing away from the West. It was a catastrophe called the Dust Bowl.

In 1935 President Roosevelt and the US Congress realized the need to create the Soil Conservation Service. The Civilian Conservation Corps, often referred to as 'Roosevelt's Tree Army', planted 3 billion trees in National Parks and along shelter belts to combat wind erosion. What a great story; a good government program that put people to work and saved the environment to boot!



A party at our neighbor's home where soil structure is being ignored, a vehicle parked on the soil where all the plants's roots live.

Every week Lesley and I are called to investigate trees that are mysteriously dying. Diseases or insects are not the primary cause. The tops of the native trees are dying and telling us a story. It may have been as long as 5 years ago when the soil structure was crushed by digging trenches, or building construction.



Typical construction site with mature trees where irreparable damage is taking place, once again.

So what builds or protects a healthy soil structure? First there are the plant roots that build soil structure. You can think of it as roots making a home for themselves, as they move through the soil.

Next, and more importantly, there are soil fungi called mycorrhizae, in combination with their allies, bacteria, that build soil structure. When you read the *Wisdom from the Trees* article, **Into The Underworld Of Trees** you learned that roots, mycorrhizae, and bacteria work together to acquire water, nutrients, and fight diseases and insects. Only recently have we learned that together, those organisms also build strong soil structure. The plant roots feed the microorganisms with sugar and the mycorrhizae convert it into a sticky glue called **glomalin** which binds soil particles into strong aggregates, which we can think of as the walls and halls of air spaces.

Back in the old days we were taught that cultivating the soil under our trees and shrub beds was good because it loosened and aerated the soil as well as getting rid of weeds. Now we know that it does just the opposite, disrupting the soil structure, compacting it and worst of all chopping up that wonderful network of microorganisms who keep the soil loose and healthy. As a result, it also seems to cultivate weeds!

And I have to mention the worms. Ever notice the sticky mucous surrounding worms on their nightly above ground travels? That sticky stuff rubs off and hardens as they mine the soil. This lines their burrows creating a network of underground tunnels and structure that allows water to percolate deeply into the soil. While they're at it, they eat leaves and poop them out to make absorbable plant nutrients.

Then there are ants. Ants get a bad rap when compared to worms, but in actuality they are soil farmers that dig and sort, plow and aerate our soils even more than worms.

Without ants our soils would be dead and lifeless and so would the plants on which we depend.

So how do we avoid the mistakes of the past and leave the legacy of a healthy environment to our grandchildren? Protect your soil structure by :

- 1) **Leaving the leaves.** Fall and spring remove or grind the leaves on the lawn but *leave the leaves under your trees, shrubs and flower beds*. This will save you time, money and decrease your carbon footprint. More importantly, it will feed an army of microorganisms that are feeding and protecting your plants while building wonderful soil.
- 2) If you can't stand the leaves then **annually add mulch to your landscape beds**.
- 3) Here's some good news which runs counter to everything we've been taught since the beginning of agriculture. **You no longer have to rototill your vegetable gardens!** Let the *microorganisms* do that. For two seasons, I have pulled the weeds in the fall (well actually I try to do it weekly) and added 6 inches of compost to my garden. In the spring there's no need to rototill. I plant my seeds right in the compost. The seeds and vegetable plants flourish because the compost has fed the microorganisms who've been working all winter building healthy soil fertility and structure.
- 4) **Do not water your lawns and landscape so often.** This also goes against common landscape practices. **The University of Illinois recommends watering lawns no more often than 1x per week for 45 minutes to an hour.** The object is to water deeply and then let the soil dry out. Soil that is sprinkled 2 or 3 x per week fills up with water and breaks down that valuable structure. The soil becomes compacted and actually water repellent which makes grass and trees less and less drought tolerant. Ever wonder why so many people have to core aerate the lawn every year? It is to break that impermeable soil and the root mat that has grown above the soil surface.
- 5) **Never park your cars on the lawn and don't ever allow trucks or heavy vehicles to drive across your landscape.** Those vehicles will make your soil as compact as cinder block. Because 90% of all tree and grass roots live in the upper foot of soil. So you're doing more harm than if you bulldozed that soil and replaced it with concrete. (FYI: The parking lots at Ravinia are supported below, with giant cisterns.)
- 6) When doing construction of any kind including installing sidewalks, irrigation, or lighting, **do not disturb the soil within the branch spread (drip line) of any trees.** Consult with us first to see how to best save the trees.
- 7) Keep the use of pesticides in your landscape to an absolute minimum. Though many people use them, pesticides are poisons. They harm the beneficial microorganisms, that are working so hard to build healthy plants.



I hope you're not getting tired of these dirty lessons. Lesley and I have taught a class called **The Dirty Little Secrets of Trees** at the Chicago Botanic Garden, and to the Illinois Landscape Contractors Association. It is so important, because what we don't see, supports EVERYTHING we do! Every major human civilization has risen because of its soils, and as you might guess, they have fallen when they have depleted or abused their soils. If you have a garden club or civic group that would benefit from the *dirty secrets*, let us know and we'll share the dirt with you.

