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Understanding Soil Health Terms

Soil health can be hard to understand if you do not know the “lingo” or terminology. Talking to a doctor, sometimes you need a dictionary to know what they are saying. Here’s a short primer on soil health terms. “Soil health” is defined by the Natural Resource Conservation Service (NRCS) as the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans. Soils contains living organisms that perform functions for humans but these organisms need food, shelter, and certain environmental conditions to thrive.

“Soil ecosystem functions” include processes like nutrient cycling, clean water (filtering, buffering, availability), soil physical stability, and soil habitat (where organisms live). Ecosystem services are grouped into four categories: *provisioning* (food production and water), *regulating* (climate and disease control), *supporting* (nutrient cycles, crop pollination) and *cultural* (spiritual and recreational benefits). Many soils are degrading rapidly especially when compared to their virgin state, before they were cultivated.

Soil texture and soil structure terms are often confused. Soil texture is the amount of soil sand, silt and clay. Soil structure is the arrangement of soil into peds or aggregates (soil crumbs). Soils with good soil structure typically have more macroaggregates and macropores while soils with poor soil structure like compacted soils have more micro-aggregates and micropores. “Macro” here means large and “Micro” means small. Compacted soils have a higher bulk density which means they are denser; not allowing air, water, and roots to move easily through the soil profile. Healthy soils tend to be “aerobic” meaning adequate oxygen while “anaerobic” soils have low oxygen. Most compacted soils are anaerobic and saturated or full of water which allows disease causing organisms to thrive.

Soils contain many beneficial organisms. Bacteria are a large group of single-celled microorganisms that lack chlorophyll (not plants). Bacteria are active in the soil for decomposing organic matter but also cause many diseases. Bacteria live in higher numbers in disturbed (conventionally tilled) soils. Fungi contain a rigid cell wall and thrive with little soil disturbance. Mycorrhizae fungi have hyphae (spider web like) networks that attach to 80-90% of most plant species and enhance plant uptake of water and nutrients. Mycorrhizae means “fungus root” and is a symbiotic (mutually beneficial) relationship between fungus and plant roots. Glomalin is a glycoprotein (sugar protein) produced by mycorrhizal fungus. Glomalin and root polysaccharides (sugars) bind soil particles together to form macroaggregates to promote good aggregate stability and good soil structure for higher crop yields.

Healthy soils are high in organic matter. Organic means it came from living matter and contains carbon while inorganic means molecules that lack carbon. “Organic” also means food or farming methods that do not use chemical fertilizers, pesticides, or other artificial agents. Many soil health farmers are moving towards adapting “organic” farming practices. Soil organic matter (SOM) has two major groups, the humus or long-term decomposed stable organic matter and the active organic matter which is easily decomposed and unstable. Generally, it’s the active organic matter which is lacking in our degraded soils. Tillage destroys the active soil carbon or organic matter. Tillage is like blowing air on a fire, the extra oxygen increases microbial decomposition and causes soils to lose carbon. Active carbon is a food source for microbes but also promotes good soil structure. Active carbon comes from live roots which exude polysaccharides (sugars) and microbial wastes (microbial poop).

Cover crops are grown to protect and enrich the soil. Cover crops enhance biological life, nutrient cycling, increase SOM, improve water infiltration and storage, improve soil structure, and protect soils from eroding. Cover crops include brassicas, legumes, clovers, vetches, and grasses. Brassicas include radish, kale, rape, turnips, mustards, and cabbage. “Daikon” radishes have white long tubers. Rape seed is a wild cousin to canola and has more roots and less grain. Legumes are peas (winter peas, Canadian field pea, cowpea). Legumes fix their own nitrogen with the help of *Rhizobium* bacteria. Technically clovers and vetches are not “legumes” but they also make their own nitrogen and are often all lumped together. Cereal or winter rye is a common grass cover crop with a wide leaf and rapid tall spring growth. Annual rye has shorter, narrow leaves, 50% more roots, but is harder to manage. Other grasses include oats, sorghum species, millets, and wheat. Buckwheat, sunflower, and flax are other cover crops. Cover crops improve soils health and make our soils sustainable for future generations.