



Conventional-tilled soil, no cover crops, vegetable grower, and chemical fertilizer.



40 year no-tilled soil, diverse cover crops/rotations, manure, and no chemical fertilizer.

What Does It Tell Us?

Indicators:

- Low organic matter, less carbon
- High wind and water erosion
- Low infiltration, poor drainage
- High crusting, increased runoff
- Low water holding capacity, droughty
- Low biodiversity below/above the soil
- Inefficient nutrient cycling
- High nutrient, loss, decreased plant uptake
- Increased weed and pest populations
- Increased susceptibility to disease
- High fossil fuel dependency

Indicators:

- High organic matter, high carbon
- Low wind and water erosion
- High infiltration, increased drainage
- Low crusting, decreased runoff
- High water holding capacity, resilient against drought
- High biodiversity below/above the soil
- Efficient nutrient cycling
- Low nutrient loss-increased plant uptake
- Less weed and pest populations
- Decreased susceptibility to disease
- Low fossil fuel dependency

References:

Slaking occurs when aggregates are not strong enough to withstand internal stresses caused by rapid water uptake. Soil aggregate stability is widely recognized as a key indicator of soil (Karlen and Stott, 1994; Arshad et al., 1996) and rangeland health (Herrick et al., 1999). It is closely related to a number of ecosystem properties, processes, and functions, including the quantity and composition of organic matter (Tisdall, 1996), soil biotic activity, (Wander et al., 1994), infiltration capacity, (Pierson et al., 1994), and resistance to erosion (Blackburn and Pierson, 1994). The stability of larger macroaggregates, particular, it is largely a function of active soil organic matter fractions (Bethlenfalvai and Barea, 1994; Degens et al., 1994; Tisdall, 1996). These fractions have high turnover rates and are sensitive to management (Wander et al., 1994).

Soil undergoes a complexity of physical, chemical, and biological processes under the impact and microflora (Soulides and Allison, 1961; Sorensen, 1974; Utomo and Dexter, 1982).

Aggregate stability measurements are affected by consistently air drying because:

- (1) additional intermolecular associations are formed between organic molecules and mineral surfaces (Kemper and Rosenau, 1984);
- (2) the process of slaking (aggregate disruption under the action of water) is induced by air-drying soil prior to fast wetting; and

(3) since drying is not uniform, unequal strains arise throughout the mass, which causes incipient failure zones and cracks to develop (Haynes and Swift, 1990). Aggregate stability varies widely across a variety of scales (Pierson et al., 1994) and soil textures.

Furthermore, the variability itself may frequently be a good indicator of ecosystem function (Herrick and Whitford, 1995).



*Reidsville, NC soils.
Left Photo: Vegetable farm with heavy tillage, chemical fertilizer, and no cover crops.*



Right Photo: Diversified livestock farm using no-till for 40 years, diverse rotations and cover crops, manure, and no chemical fertilizer.

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