



### Notes:

To begin to understand how to evaluate the health of a soil from a biological perspective, we need to change our view on how soil functions. Instead of looking at profiles and texture we need to look at the biological processes or spheres of influence that are taking place working in concert together.

This information is taken from a paper entitled “**A hierarchical approach to evaluating the significance of soil biodiversity to biogeochemical cycling**” by M.H. Beare and others. Some direct quotations:

- Soils can be viewed as being composed of a number of biologically relevant spheres of influence that define much of their spatial and temporal heterogeneity.
- They are formed and maintained by biological influences that operate at different spatial and temporal scales. Although not mutually exclusive, each sphere has fairly distinct properties that regulate the interactions among organisms and the biogeochemical processes that they mediate.
- Probably more than any other biological factor, the composition and structure of plant communities determine, directly or indirectly, the physical, chemical and biological properties of soils. Individual plants can have markedly different zones of influence in soils.

## Spheres of influence (biological processes)

### 1) Detritosphere (soil armor)

- Protects the soil aggregates (aggratusphere) and the pores (porosphere) from the sun, wind and rain
- Lowers temperature
- Reduces evaporation
- Provides habitat and food for soil organisms
- Enhances biogeochemical nutrient cycling
- Builds soil structure and nutrient reserves

### 2) Drilosphere (bio pores)

- Redistributes plant litter "Carbon" throughout the soil the profile
- Soils are enriched with N,P, and humified organic matter
- Increase water infiltration
- Provide a bio pore for plant roots
- Homogenize soil surface
- Increase bio-diversity in soils

### 3) Porosphere - The lungs and circulatory system of the soil:

- Regulates water and air flow
- Impacts N, P Mineralization
- Impacts soil organism bio-mass and diversity
- Site of nutrient exchange
- Site of mycorrhizal entanglement and sequestration of water and nutrients
- Root interface
- Part of the water cycle

### 4) Rhizosphere

- Narrow region of soil directly around roots
- Living roots release many types of organic materials
- These compounds attract Bacteria that feed on the proteins & sugars

### 5) Aggregatusphere

- Lack of good soil aggregation results in compacted soils that:
  1. Restrict root growth
  2. Provide poor root zone aeration
  3. Have poor drainage

Soil compaction has always been thought of as a physical soil problem caused by excessive tillage and heavy equipment squeezing the soil pore space. Compaction is actually a result of loss of soil organic matter and destruction of soil aggregates. These need to be replaced in the soil in order to provide a stable soil base in which to produce food & fiber.

**Soil compaction is a biological problem related to decreased production of polysaccharides and glomalin in the soil. Soil compaction is due to a lack of living roots and mycorrhizal fungus in the soil.**