Title: GET SOIL SMART #2

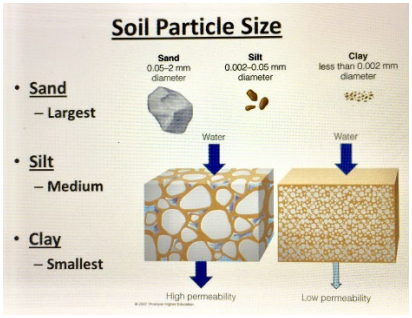
Last newsletter we talked about the 4 major components of soil: Mineral Particles (sand, silt, clay), Air, Water, and Soil Organic Matter. We will explain more of their characteristic and function, alongside the other important players in the soil realm: Humus (hyoo-mus), Roots, and Soil Organisms.

Let's start with breaking down the **mineral particles**:
SAND (2.0mm – 0.05mm) is the largest of the 3 particles where individual units can be seen by the naked eye. Sand, with its large size, has large pore spaces surrounding each particle, providing the soils with very good aeration and drainage qualities, however, when sand content in a soil is high, these qualities increase the potential of erosion, and greater risks of water, nutrient, and soil organic matter loss.

SILT is small (0.05mm – 0.002mm), individual particles can be seen under a microscope, and feels smooth like flour. It is granular in shape, like sand, but is smaller and has greater surface area creating more channels of pore space in which to retain water. Silt's characteristics and function are middle ground between Sand and Clay.

CLAY is very small (<0.002mm) and is plate-like in structure, which results in many horizontal channels between plates, and thus a very high surface area. This structure and the negative charge it carries, allow clays to hold water and nutrients very strongly, resulting in very slow movement and plant uptake. This can be detrimental to plants, particularly in drier times of the year when clay-based soils have even less water available for plant uptake.

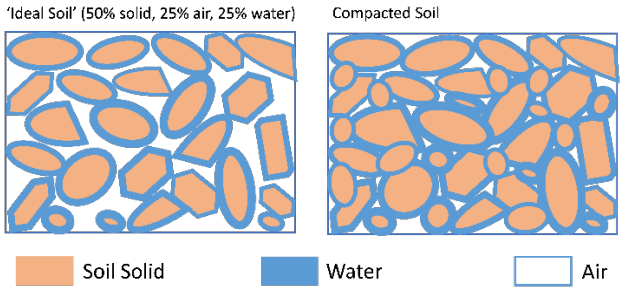
Below is a diagram that can help you visualize the different in soil particle size and how the composition in a soil can look and determine water flow, among other soil processes.



Website: Briscoe Bites

Air in soil provides plants with oxygen for growth and it influences the availability of many nutrients, as oxygen enables microorganisms to mineralize or decompose nutrients from the organic form to a plant available inorganic form, such as nitrate (NO^{3-}) and ammonium nitrogen (NH^{4+}).

Air, along with water and plant roots exist in soils **Pore Space**. The "ideal" soil, one that is medium textured and positively functioning, can be broken down as follows: 50% soil, 50% pore space (25% air, 25% water). The amount of pore space of a soil ranges from 25% to 60% due (largely) to: soil type, organic matter content (increases pore space), and compaction of the soil (reduces pore space).
The image below illustrates pore space in 2 different situations. What are the benefits and drawbacks of plant growth in each?



https://agrilife.org/texasrowcrops/2015/11/04/wet-weather-field-traffic-more-soil-compaction-reduced-nutrient-use-efficiency-and-yield/

Water is an important component of soil, with a variety of responsibilities. The obvious responsibility being to feed plants – providing a water source and a nutrient carrier. Water helps soil particles bind together to form larger aggregates, helping to maintain soil structure and stability. Water helps to regulate soil temperature, which is important to plants as it determines how plants are able to adsorb water and nutrients and also have positive root growth. Soil water also provides habitat for soil organisms such as microfauna (i.e. nematodes, protozoa), and microflora (i.e. bacteria).

Organic Matter (OM) is a massively important fraction of the soil because it improves soil health and improves plant productivity. OM is composed of plant and/or animal tissue, and provides the following benefits:

- OM improves water holding capacity, making water available for plant uptake
- OM has a great ability to hold all essential plant nutrients, increasing overall soil fertility.
- OM provides stability to soil aggregates and soil structure, decreasing erosion potential.
- OM feeds microorganisms and earthworms, improving nutrient cycling and water infiltration
- OM helps prevent compaction, allowing soil processes to continue uncompromised.

Organisms within the soil e.g. bacteria, fungi, invertebrates (insects/earthworms), and vertebrates (moles/mice) are beneficial contributors to the overall function and health of the soil. Each add to the OM of soil, they aid in OM decomposition, and they aerate the soil creating new pathways or pore space through the soil.

Plant **Roots** are just as fascinating as the above ground plant, they not only provide structure for the plant, but they also provide structure and stability for the soil. Think about trees being planted on hillsides! Roots redistribute carbon and nutrients throughout the soil profile and leave behind OM after they die, providing residual effects to the plants growing in the following season.

Humus is the final stage of decomposition of plant and animal matter. It is the stable portion of soil OM, and does not contain soil particles. Humus is very porous and rich in nutrients and contributes these 2 qualities to the soil with the benefit of increasing air and water holding capacity of the soil.