SOIL

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The turf on tees, fairways, and greens on an average 18 hole golf course has a basic value of approximately $255,000.00. It is the most valuable single fixed asset a club has.

Of all the factors that affect the health and welfare of the turf, soil is the greatest. It provides an anchor for the roots, and from it they take nourishment, water, and a large amount of air.

Many kinds of shapes of particles make up a soil. Some are very stable and remain unchanged for long periods of time, such as the sands, silts, and clays. Others are less stable and undergo change relatively fast, such as organic matter including dead plant and animal remains.

Soil which is ideal for growing turf is teeming with life. A handful of it will contain more living individual microscopic plants and animals than there are people on earth: Living down under among the soil particles and plant roots are billions of bacteria, protozoa, fungi, viruses, nematodes, and others that make up the micro-organism population of the soil. Most of them are beneficial and their welfare is vital to the success and prosperity of the turf. It is through their activity that most of the plant food elements become available to the turf.

Between the soil particles are open spaces called pore spaces where the air, water, organic matter, micro-organisms, and roots exist. Entry and movement of air and water into and through the soil is very important since grass roots and benecifial organisms require air and moisture to live and grow. If these passageways or openings are too small, the movement of air and water is restricted. Grass roots will not penetrate soil that does not have adequate pore space to provide the necessities of life.

Since the soil is made up of various sized and shaped mineral particles, such as sand, silt, and clays and organic matter, a consideration of these materials will help us understand soil structure. Mass and weight is given to soil by sand which is the largest of the mineral particles. We can easily see these with the eye and estimate them by rubbing a pinch of moist soil particles between the forefinger and thumb as the sand particles will roll over. It is the various size sand particles that contribute most to the pore space. They also serve to dilute the very large number of smaller particles, such as silt and clay to keep them from packing together to prevent the entry of roots, air, and water. Pore spaces can be too large to provide a good home for the roots as in the case of soils which are mostly large sand particles. They flood easily during rains and tend to be droughty at other times.

Silt particles are intermediate in size between sand and clay. It texture and feel, they are very much like baking flour and have a tendency to fall in between the sand particles to partially fill up the pore spaces in the soil. By doing this, they help reduce large pore spaces in size and slow down the movement of air, water, and roots through the soil. When these small particles are rubbed between the thumb and finger it feels tike they are sliding over one another.

The surface of the soil particles, especially the smaller ones, play an important role in the capacity of a soil to hold and store water and plant food elements. Clay particles, which are so small they can only be seen with a powerful microscope, have very large surfaces per unit volume. This is a desirable feature in soils as is provides more space to store food and moisture. This can be illustrated by comparing a unit mass of sand, silt, and clay. One cubic inch of clay will have from 30 to 40 time more surfaces than an equal unit of sand and from 2 to 5 times as much surface as the same volume of silt. Most desirable soils contain somewhere around 25% of their volume as clay. This desired portion of clay may become objectionable if it is concentrated in a mass or layer in the soil, as it closes up the pore spaces. Clay particles accumulate in pockets in the soil or layers will restrict the penetration of roots, air, and water until the soil is not suitable for plant growth. Such conditions often develop in natural soils and have to be corrected.

Organic matter is another kind of material found in soil in varying amounts. These organic materials are the minute fragments and remains left from the decomposition of plants and animal residues in the soil. They are varied in shipe, and range in size from larger than sands, to the very fine clays. Organic particles are usually porous or spongy in nature and when found concentrated in the soil are called various things, such as peat, humus, etc. They help materially in holding moisture and plant food. Micro-organisms are continually attacking organic matter, decomposing it, and releasing carbon dioxide, plant food, and water.

Organic matter gives soil its black color. However, black color does not always indicate a good soil. A tight, non-porous soil is of little value for growing grass regardless of its color. Black soils are often called top soils and may be nothing more than black swamp muck which is of little use in producing grass.

Soils of any color which have good structure will produce excellent grass when fertilized. Light colored soils will often produce better turf than dark soils which are mostly clay.

Structure is the aggregation and arrangement of soil particles. An ideal soil structure for grasses is one in which the soil components — sand, silt, clay, and organic matter — are in the proportions and arrangement that will provide adequate pore space for vigorous root development and storage for water and plant food.

Clay soil structure can be improved by the addition of organic materials (peat, humus, etc.) and coarse mineral particles (sand). Sandy soil structure can be improved by the addition of organic materials and fine mineral particles, such as silt and clay.

It is easier to improve sandy soils than clay soils due to the difference in number of particles. Clay soils have millions more particles per unit volume and it is difficult to mix sand and organic particles in between such a large number of clay particles.

Once a clay soil has been improved to a good deep loam, it will remain a desirable soil for a long time. An improved sandy soil will seldom remain in good physical condition for more than a few years. Such a soil must be continually improved by aerifying and working in organic material.

A program of continual soil improvement which includes aeration, plus the addition of conditioning materials and plant food elements, will do much to insure the safety of the turf.