

UNDERSTANDING TURF MANAGEMENT

The first in a series by
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THE SOIL

The logical place to begin an understanding of how to grow better turf is to start with the soil on which the grass grows.

While the turf manager may provide protection against insects and disease, the primary management function, with the exception of mowing, is the correction of the soil conditions to those which optimize turf growth.

The first function of a soil is to provide an anchor for the roots of the plants. Anchorage is dependent on the depth of grass rooting and density of the roots in the soil.

Anchorage may not seem important for such a low growing plant, but the anchorage provided by the roots in the soil is very important in athletic turf. The turf must be well anchored to prevent the turf from being torn loose by the short turns and sudden stops of the players. A field built on a sand base is particularly susceptible to this damage if put into play before the grass has fully developed a root system. Likewise a newly sodded or seeded field is subject to the same damage.

The second function of the soil is to provide the three essential ingredients for good plant growth.

They are plant nutrients or food, water and air.

With the exception of carbon from the carbon dioxide in the atmosphere, all of the elements required for grass growth are obtained from the mineral material and organic matter in the soil. The water absorbed by the root system comes from the soil. Furthermore, the elements in the soil that the plant requires for growth must be dissolved in the soil water before they can be taken up by the grass. Air is necessary in the soil to allow the root system to exchange oxygen and carbon dioxide in the process of respiration, an essential life process in plants as well as in animals.

The air and water in the soil are found in the pore spaces; those cavities between solid particles. A perfect soil would contain 50% pore spaces and 50% solid material on a total volume basis. Through the intricate formation of the soil structure, however, such a porous material is still supportive of great weights, i.e., tractors and mowing equipment.

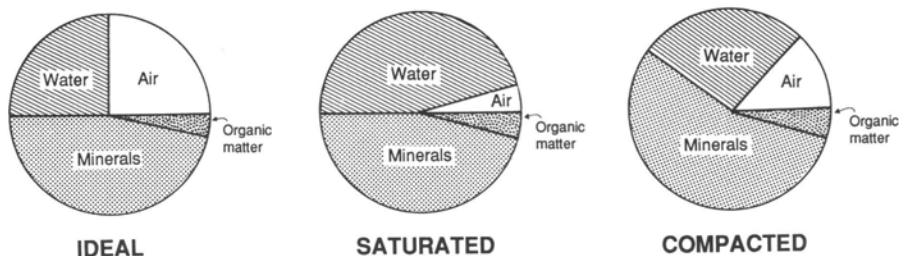
The solid portion of the soil has two components, organic matter and minerals. Of the total volume of a soil only 2.0 to 2.5% may be organic matter, however, it is so vital to the growth of grass that its importance for soil properties and turf growth far exceeds the small proportion

found in the soil. The remainder of the solid portion is mineral material ranging in size from the smallest clay particles, only observed in photographs by electron microscopes, to stones and gravel. It is the mineral material in the soil which provides most of the elements the grass requires for growth.

The pore space or empty space between mineral particles is occupied by air and/or water. In the perfect soil half of the space would contain air and half would contain water. As the soil dries more and more of that space becomes filled with air, whereas when the soil becomes wetter the soil pores contain less and less air. Eventually the soil would contain no air, a condition known as waterlogged or poorly drained.

Because the soil contains little air when it is saturated with water, normal root respiration is reduced. Without respiration uptake of plant food is slowed and in turn plant growth is retarded. If this condition is allowed to persist in sports fields a shallow root system develops, reducing the anchorage of the turf. The relationship between soil water and soil air is the reason why a adequate drainage system is essential in a sports field.

In a well aerated soil the composition of the air is similar to that of the atmosphere which is 79% nitrogen, 20.9% oxygen and .03% carbon dioxide. Normally the soil has slightly higher carbon dioxide levels than the atmosphere. Within 48 hours of the soil becoming saturated with water, however, the concentration of carbon dioxide increases and the amount of oxygen decreases sharply. The soil is now said to be anaerobic [lacks oxygen] in contrast to a normal or aerobic soil. In addition other gases such as methane and ethylene begin to be formed. Ethylene a low concentrations acts as a plant hormone, interfering with



The relationship between soil minerals, organic matter, air and water under ideal, saturated and compacted soil conditions.

normal plant growth.

The aeration of the soil is also decreased by compaction. Continued traffic, particularly when the soil is excessively wet, causes the soil particles to move closer together. The water actually facilitates the process, acting as a lubricant for the movement of soil particles. When compaction occurs the larger pores

are compressed first. It is these larger pores that are important in the free transfer of gases in and out of the soil. Similarly the rapid movement of excess water from the soil is dependent on the larger pores.

Compaction also increases the physical force the root must exert to penetrate the soil. Experiments have shown, however, that if adequate

oxygen is provided the physical limitation is greatly reduced, indicating the first limitation to root growth in compacted soils is aeration.

Hence the understanding of the relationship between pore space, air and water is critical to the proper management of turf.

OUR MEMBERS

PROFILE OF G.C. DUKE EQUIPMENT LTD.

G.C. DUKE EQUIPMENT LTD. was incorporated in 1955 under the trade name of Duke Lawn Equipment. Prior to this incorporation, its founder and President, G.C. Duke, operated for several years as a proprietorship. In 1983, the company's name was changed to its present form. This change was necessitated as the company's name suggested that its business had to do with lawn equipment only when, in fact, the company has, over the years, greatly broadened its product range. The company's diverse range of products includes 750 h.p. airport snowblowers, 95' aerial devices, large municipal streetsweepers, large municipal-sized sewer cleaners, and, of course, a full range of lawn equipment.

The company is situated on a 5 acre site in Burlington where it maintains a large warehouse and parts facility which is backed up by its separate, modern service facility.

G.C. Duke Equipment Ltd.'s major market area is in the Province of Ontario where it markets its industrial products on a direct basis to golf courses, parks departments, municipalities, and Provincial and Federal Government Departments.

The company also has a group of dealer salesmen who market many of the company's products through lawn and garden, and farm equipment dealers throughout the province.

In 1982, the company formed Turfco Inc., a Quebec corporation, to duplicate all of the sales, service, and parts activities in the Province of Quebec. This company has been enormously successful in serving the equipment needs of its customers in "La Belle Province".

The Duke/Turfco organizations sell a wide range of grounds maintenance equipment. Included in these



equipment ranges are well-known manufacturers such as Athey, Mott, National, Kut-Kwick, Ryan, Cushman, Ransomes, Sweepster, Super Products and the Hi-Way Equipment Company.

The company is headed by its President and founder, G.C. Duke, who for many years has made it a policy to make sure that the company was actively involved in the associations of its various customer groups. A few of the organizations in which the company holds a membership are The Ontario Parks Association, The Nursery Sod Growers Association of Ontario, The Canadian Golf Course Superintendents Association, The Alumni Association of the Niagara Parks Commission School of Horticulture, Landscape Ontario, etc.

In 1963, G.C. Duke Equipment Ltd. began offering two scholarships yearly to the University of Guelph. Similarly, in 1983, the company began offering two scholarships to the Niagara School of Horticulture. The company also sponsors an annual golf tournament for Assistant Golf Course Superintendents in the Province of Ontario.

For many years, the company has received "Best Distributor" and "Quota Buster" awards from many of its suppliers. All of the plaques of recognition from its various suppliers are proudly displayed in the company's showroom.