TURFGRASS MANAGEMENT - GETTING THE BALANCE RIGHT

Martyn Jones 1st Class Training

Turfgrass managers are caught in a dilemma between the constraints that nature sets on the growth and development of turfgrass plants and the unnatural demands set by sportsmen and sportswomen in their quest for perfect playing surfaces. A turf manager's role is to:

a) provide playing characteristics appropriate to the sport
b) maintain healthy turfgrass
c) preserve the integrity of the rootzone material

Evolution has not anticipated that turfgrass plants may be continuously defoliated to 5mm or less, as is the case with golf and bowling greens; or the abrasive wear at Centre Court during Wimbledon fortnight. Nor has Mother Nature prepared herself for the upsurge in golf courses or enclosed soccer stadiums. Instead, Mother Nature has, for millions of years, adequately catered for infrequent grazing of animals during the growing season when soils are relatively dry and well aerated. She has provided earthworms to structure our soils; she has allowed grasses to recover from grazing before being subjected to further attack. She has even allowed death from starvation to reduce the grazing population and lessen the demands placed on the grasses.

Our sportsmen and sportswomen are not as considerate as Mother Nature and continue to place greater and greater demands on our turfgrass areas. We may plead for the grasses to be given a chance but our requests will generally fall on deaf ears. Consequently, science has had to come to our rescue. We now accelerate evolution by breeding new grass strains; we have an array of chemical formulae to protect the grasses; we design and create new soil components; we engineer irrigation, drainage, and heating systems to manipulate the climate; and we formulate chemical concoctions to feed our grasses.

But we are still governed by many of Nature's rules and are still at the mercy of our climate. We have created an unnatural environment within the general domain of nature.

The vast array of products nowadays at our disposal sometimes appears to have overshadowed the importance of the essential components for healthy turfgrass growth and development. The products of science, formidably marketed by talented sales staff, receive an enormous amount of media attention. I feel that, under such pressure, turf managers are often distracted from thinking about the ESSENTIAL requirements of growth - water, air and sunlight. Without water, air and sunlight (none of which are the products of scientists or engineers), neither photosynthesis nor respiration can occur and, without these processes, we have no grass plants. These are the basics of life and cannot be taken for granted.

Yes, we can fine tune our surfaces by means of manufactured products but the essential components must first be in adequate supply. It matters not a jot how much any of the manufactured products are used if there is a substantial lack of any of the essential ingredients.

Currently, the lack of sunlight in our northerly location is a restriction that we must accept, although management practices can reduce the detrimental effects of low light intensities. Achieving a balance of the other essential elements can, to some extent, compensate for the natural low light intensities that we experience.

THE AGRONOMY TRIANGLE

Precipitation, whether from natural rainfall or artificially applied irrigation, has a profound effect on rootzone aeration. Water fills soil pores to the exclusion of air, resulting in a decrease in soil aeration. Excessive use of fertilisers, particularly nitrogenous fertilisers, results in the production of organic matter that will clog pore spaces, again to the exclusion of air.

Without adequate soil aeration, the system becomes unstable and turfgrass quality declines. Many turfgrass managers hold the fallacious belief that turfgrasses are maintained in a healthier state by severely restricting water and nutrient input. This is because, in the majority of cases, soil aeration is already restricted. By concentrating on maintaining adequate soil aeration, detrimental effects of judicious irrigation and fertilisation do not occur and the turfgrass plant is kept in a healthier state. Good soil aeration is at the crux of good turfgrass management. However, it is one of the most difficult things to achieve, particularly when a rootzone material is inferior.

THE GAME SQUARE

Adding 'WEAR' to the equation aggravates the situation still further. Now, soil compaction decreases the number and volume of soil pores and can reduce soil aeration significantly. Often, in an attempt to compensate for wear, turfgrass managers will increase irrigation and fertilisation applications to stimulate growth. As in the 'Agronomy Triangle' soil pores become filled with water and organic residues, further depleting oxygen reserves in the soil. Collapse of the system is even more certain.

When 'SHADE' is also added to the configuration, as in the case of many of our new soccer stadia, the problems are further increased. Soil will not dry as readily in shaded environments and will, therefore, have water-filled soil pores for a longer period. Photosynthesis is not as efficient, resulting in lower carbohydrate reserves within the plant, and subsequent shallow rooting. This results in greater organic residue accumulation in the surface layers of the soil and subsequent reduction in soil aeration. Turfgrass diseases are more severe in shaded situations and premature death of leaves, shoots and roots adds greater quantities of organic residues to the soil, again reducing the aeration porosity and drainage characteristics of the rootzone material. It is a vicious circle that will inevitably result in collapse of the system.

A thorough understanding of the elements that constitute a well-aerated soil is vital to the management of turfgrasses for sport.

Soil aeration is a **'CONDITION'** - not a maintenance operation. An adequate supply of oxygen must be uniformly distributed throughout the rooting zone. The presentation discusses various aspects of mechanical aeration and their effectiveness in different soils.

A soil in which the air-filled porosity exceeds 10% of the soil volume will produce an 'Aerobic Rootzone'. But, but a soil with an air-filled porosity less than 10% of the soil volume will produce an 'Anaerobic Rootzone' within 24 hours.

SIZE CLASSIFICATION OF SOIL PORES AND SOME FUNCTIONS OF EACH SIZE CLASS (FROM BREWER, 1964)

SIMPLIFIED CLASS	CLASS	DIAMETER RANGE (μm)	CHARACTERISTICS AND FUNCTIONS
Macropores	Macropores	> 75	Water drains by gravity, accommodates roots, habitat for certain soil animals
Micropores	Mesopores	30 - 75	Retain water after drainage, transmit water by capillarity, accommodate fungi and root hairs
	Micropores	5 - 30	Retain available water, accommodate most bacteria
	Ultramicropores	0.1 - 5	Retain unavailable water, exclude most micro-organisms
	Cryptopores	< 0.1	Exclude all micro-organisms, too small for large molecules

The presentation discusses ways and means of achieving adequate soil aeration and the restrictions that occur in a variety of soils and situations.

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