



The Soilsmart Newsletter

Issue 7 August 2006.

MANAGING SPORTSFIELDS IN A CHANGING ECONOMIC CLIMATE

Over the past year, we've been asked to provide advice on an increasing number of turfgrass problems in a variety of different situations, however most of the issues turf managers are facing can be summarised under the broad heading -

ANAEROBIC SOIL CONDITIONS

It would appear that maintaining 'aerobic' soil conditions is becoming increasingly difficult as the pressures placed on sportsfields increase. We thought therefore that it may be useful to provide some discussion on the subject, hoping it may be of some assistance to turf managers trying to balance the need to manage and present sportsfields in a reasonable condition, with -

- ✓ A general increase in the use of sportsfields
- ✓ A shortening of any 'off season' for renovations
- ✓ The impact of changing climatic conditions

HOW DOES THE COMBINATION OF THESE FACTORS IMPACT ON THE MANAGEMENT AND QUALITY OF SPORTSFIELDS ?

Turf grasses, like most plant species were designed to live in an aerobic soil environment, but as we are finding *many of our sportsfields are becoming anaerobic*, largely as a result of soil compaction through overuse. But as well as becoming physically hard, increasing the risk of player injury and preventing root extension, there is much more going on in compacted soils that we need to understand.

Anaerobic conditions refer broadly to a reduction in the amount of Oxygen present in the root zone, which are most often caused by physical compaction, or by filling the pore spaces through excessive watering. Anaerobic conditions can be localised as well, harbouring disease organisms in a heavy thatch layer for example.

WHY ARE ANAEROBIC CONDITIONS HARMFUL ?

The issue of anaerobic soils starts with porosity, but ultimately it's about having the wrong group of organisms present in the soil profile.

Soil porosity is another way of describing the amount of air space there is in the soil. The pore space in the soil makes up from 30% to 50% of the total soil volume. Part of this space is taken up by water and the remainder by air. As the quantity of water is increased, or as pore spaces collapse under compaction, the rate of air diffusion between the atmosphere and the soil is reduced. A reduction of as little as 10% can seriously affect the ability of roots to breath.

The release of carbon dioxide is a natural respiratory function of *both the leaves and the roots of plants*, it is necessary therefore that adequate ventilation is available to facilitate air exchange both above and below the ground. If the ventilation of the soil is inadequate, unwanted respiratory by-products will accumulate, and as Oxygen become progressively limiting, a point is finally reached where anaerobic organisms will start to dominate the soil.

Anaerobic organisms produce extremely low pH metabolites (pH of 2 or less), which affect soil pH and modify the way that nutrients are made available to the plant, altering both the form and solubility of nutrient elements. In their reduced state, certain types of these elements are taken up by the plant more rapidly than they can be metabolised, thereby becoming toxic, whilst others become limited in availability.

Ultimately, root systems become dysfunctional in anaerobic soils, and as a result, their ability to absorb water and nutrients is significantly reduced, causing the plants to develop symptoms of nutrient deficiency even though adequate levels exist in the soil and show up in conventional soil testing.

Anaerobic soil conditions create an environment which favours disease causing organisms, such as Pythium, Fusarium, Anthracnose, Brown Patch and others. If these conditions are prolonged they can also result in a shift in the balance of organisms such as nematodes, with root feeding nematodes, also favoured by anaerobic conditions, able to become active and dominant causing severe problems.

MAINTAINING AEROBIC SOIL CONDITIONS HELPS WITH WATER & NUTRIENT MANAGEMENT AS WELL.

Healthy, well structured soil is built and maintained by the constant activity of beneficial 'aerobic' soil organisms, and in the same way that natural soil systems work, these organisms also regulate the majority of soils functions. The adjustment of pH, the cycling of organic matter and minerals into plant available nutrients, the balancing of cations within the soil, and the ability of the soil structure accept and retain moisture, are all standard features of the correct soil biology being present.

Unfortunately anaerobic organisms just don't perform the same work. As we have discussed, anaerobic organisms interfere with soil pH and nutrient availability, and they increase the likelihood of disease, but they can't build or maintain soil structure either. Consequently without the natural structure building efforts being performed pore spaces in the soil collapse further, making water infiltration and retention more difficult.

HOW DO YOU OVERCOME ANAEROBIC SOIL CONDITIONS?

Of course we all know about aeration, and there are numerous machines that can physically penetrate the soil surface to provide aeration, so why not just punch more holes into the surface ?

Whilst aerators are certainly useful, we must remember that these machines only impact 5% or less of the soil surface, so while they may provide some short term relief, they are just ***no substitute for the billions of pore spaces per square metre*** that are present in a truly healthy, well structured soil.

We're not knocking aerators though, because they can give quick temporary relief, particularly if you have a severe problem. They are also useful for opening up the surface to allow quality remedial products, particularly quality liquid inoculants, into the profile in very compacted sites.

Top dressing can provide some relief, however the benefits of top dressing are often short lived as this layer will also compact once the field is back in use. There is yet another issue emerging as the demands for sportsfields increase - many of our sportsfields ***no longer have a clearly defined 'off-season'*** when traditional renovations can take place.

To overcome anaerobic conditions and the current usage issues, we need to rebuild beneficial soil organisms using non-invasive techniques. We now have effective liquid

inoculants that can fit into busy usage patterns and work schedules. With an effective program of replenishment, beneficial organisms can start to rebuild soil structure and aerobic conditions. The billions of micro-pores created in this process will provide air flow around the roots and trap capillary water and gravitational water in the soil. Water which would otherwise end up along with the nutrients it carries, in the sub soil and eventually the water table.

With time, and the biological community functioning properly, thatch and other decaying plant material will be biologically decomposed, building stable humic compounds (humus) in the soil. Humus is a sponge like substance that results from the microbial decomposition of organic matter. It is very stable and has a high cation exchange capacity (CEC between 300 & 1400) increasing the soils ability to store nutrients, so we end up with a soil that can ***retain moisture and nutrients*** for longer periods. Having the correct group of organisms present will also help break down salts and other toxins, something which is particularly relevant where recycled water is used.

The remediation of anaerobic soil conditions and the consequent decline in pathogenic organisms will also reduce the need for chemicals, the labour and fuel needed to apply them, and the costs and risks associated with their use.

WHERE TO FROM HERE?

Ideally we need to assess your prevailing soil conditions in terms of all three major soil functions,

BIOLOGICAL - CHEMICAL - PHYSICAL.

Once this is done, we can help you develop a simple and cost effective biological management program which doesn't have to interfere with the use of the grounds.

Please contact us to arrange an assessment of your sportsfields, or for further information.

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