

The life beneath **YOUR FEET**

After linking with the GCMA as an approved supplier partner, Kerr Hunter, Symbio's UK and Ireland Business Manager, explains **soil biology and its role in golf course management...**



Established more than 30 years, UK based soil biology specialists Symbio have been working with golf venues across Europe since their inception. With sustainability and climate change key considerations for both course and club management, and the withdrawal of a number of chemical applications in recent years, their philosophy of managing soils and turf as nature intended has never been more relevant. We took a look 'beneath ground' to find out how, and why, golf venues should be more focused on soil health.

The Symbio philosophy

Grasses, trees, shrubs and heathers have been able to grow quite healthily since the beginning of time, even in the face of some extreme weather patterns, but regular readers of 'turfTwitter' will observe how extreme weather problems are influencing playing surfaces, from poor growth in a cold spring to soft surfaces due to a wet winter (or even summer!).

Looking around the golf course and beyond, have you ever wondered why, quite often, less managed areas cope better with such conditions? It's all to do with the soils we grow in. Natural soils contain the nutrients, water, air and microbial species required to support a healthy plant above ground. It sustains good grass growth, is free draining when required, but can also hold sufficient water. Plants grown in such rootzones have fewer disease pathogens, such as Fusarium, Take-All Patch and Fairy Ring, and the finer grass species we associate with golf greens, fescues and bent grasses, are supported and dominant.

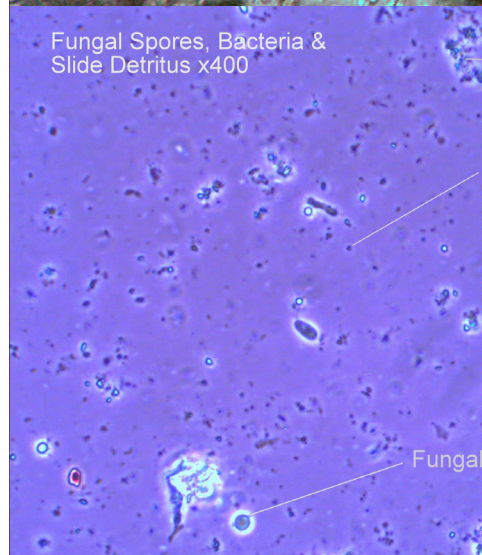
The life beneath your feet

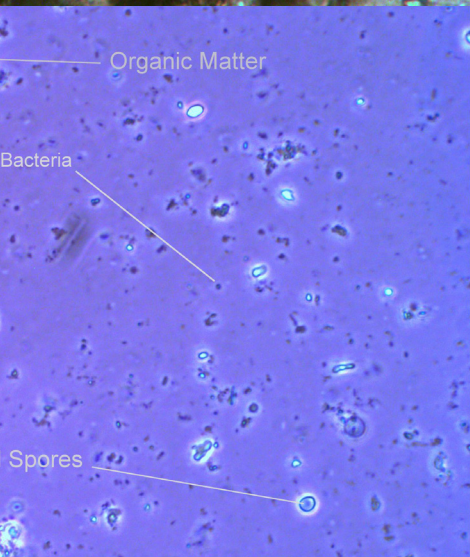
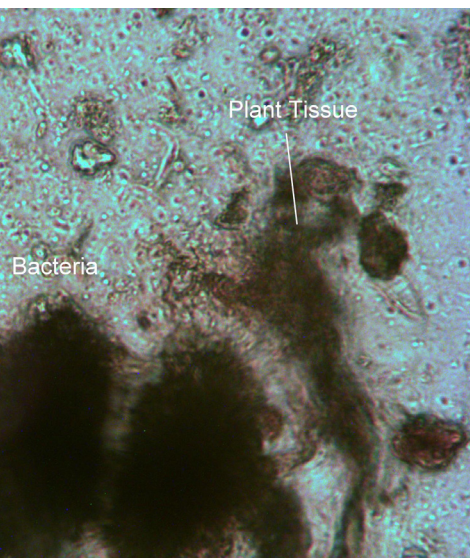
What makes soil healthy? The simple answer is when it's carbon rich, full of biological organisms, and capable of holding nutrients, air and water. The ground beneath our feet should be full of life. From the smallest bacteria to larger organisms like worms, they form a complex soil food web and are a major influence on soil's ability to be classed as healthy.

Bacteria are microscopic, single-celled organisms that live in the rhizosphere, the area around the root, and are responsible for digesting plant root exudates and organic matter. They are an essential part of the nitrogen cycle, recycling other nutrients that are made available to the plant or grass. Bacteria are also able to produce other by-products like enzymes, vitamins and hormones, which aid growth. Bacteria can form a protective coating around plant roots against disease pathogens, as well as forming a barrier in the soil to repel diseases.

Fungi are multi-celled organisms that usually grow as long strands or threads called hyphae in the soil. They digest carbon and lignin compounds found in decaying plants, especially thatch. Organic acids produced by fungi lower pH and efficiently solubilise phosphate, calcium and other nutrients locked up in the soil. In conjunction with bacteria, they also help form soil structure whilst making it friable and free-draining.

Mycorrhizal fungi are especially beneficial as they extend the root system by mining nutrients and water from the soil and making them available to grasses. They have a strong symbiotic association with finer grasses like fescue and bent. It is this for this reason that these grasses can colonise and survive in difficult areas with less applied water and





nutrients, as they are making available water and nutrient already in the soil in exchange for the plant's exudates.

Protozoa are single-celled animals that feed primarily on bacteria and fungi, even other protozoa. They also eat and solubilise organic matter, playing an important role in nutrient cycling by eating around 10,000 bacteria daily. They are also an important food source for other soil organisms. Protozoa can release excess Nitrogen making it available to the plant.

Nematodes are four types of microscopic worms. They help improve soil structure, releasing excess Nitrogen by making it available to plants. They have received bad press because of one species that feeds on roots, but the other species are an important part of the soil food web and have been used to reduce leatherjacket and chafer grub attacks.

Soil biology and its role in golf course management

In an ideal world, the soil food web would go about its business with all plants growing healthily, but we know that golf courses experience issues with thatch build-up, outbreaks of disease, dry patch, waterlogging, fairy rings, and poor growth. If soil microbes are responsible for preventing such problems, why do we have them, you might ask? The answer lies with what we have been doing to our soils in a quest for healthy turf.

Turf managers have been able to apply chemicals in order to help keep turf healthy. These include fertilisers, pesticides, wetting agents and metals such as iron to control moss. However, many of these compounds damage soil microbial populations. Fertilisers often have a high salt index, and

the higher the salt content the more damage it causes to living microbes. Humans are advised to reduce our salt intake, but if you are a single-celled bacteria or strand of fungi responsible for degrading thatch or suppressing disease, you don't fare well against kilos of synthetic salt.

Because of increased chemical usage to enhance playing conditions and presentation, we have diminished the natural processes responsible for creating healthy plants. Pesticides used to prevent or treat turf diseases do not distinguish between those pathogens and good microbes responsible for degrading thatch or supporting nutrient uptake. Healthy soil has fewer disease attacks to begin with as a result of a balanced soil food web. Increased prevalence of disease on the golf course is a sign that the food web is off-balance, and further treatments lock soil in that unhelpful cycle. Restoring the soil food web can break that chain, resulting in healthy plants less susceptible to disease.

A useful analogy is the effect of antibiotic medication on the human microbiome. When ingested to treat infection, they also wipe out all the beneficial bacteria in our gut. We now know that antibiotics have been overused, which has reduced their efficacy over time. Research has also shown that the health and balance of our gut microbiome is critical to our overall health and wellbeing, including our immune system.

The impact on turf isn't just from products applied to it. When the thatch layer in turf thickens, it holds more water and harbours disease, so invasive, disruptive physical work takes place to remove it. This impacts playability, endured for the long-term good,

and this process is repeated year-on-year. This is a consequence of the chemistry used to produce lush green growth the golf industry has come to expect.

Topdressing with sand is necessary to create smooth surfaces, but have you noticed a huge increase in the volume of sand applied to playing surfaces in order to dry and firm them? They're often wet and spongy due to thatch build up, then thatch is further diluted with sand. It is reduced through hollow coring or scarifying, but it's building up because natural bacteria and fungi that degrade organic matter are not present in abundance. This is because chemicals applied to increase growth or stop disease also prevent natural degradation, and so the cycle continues.

We see the pros and cons of sand usage in sports turf. The issue is present from the point of construction. Golf greens built with sand are dry and free-draining, but immediately lack natural biology and require greater maintenance. Physical work to remove thatch build-up and chemical applications are required to provide necessary nutrients, all because sand cannot hold onto elements due to its neutral charge. Grass grown in inert sand is also weaker because it has a greater nutrient requirement, and as a result is more susceptible to disease, so more fertiliser is applied to sustain play, and round we go again.

A world of benefits from a natural approach

By breaking the chemical and physical dependent cycle and adding and nurturing biology, we observe beneficial results and improved turf quality. A microbial rich and biodiverse rootzone fed with organic compounds will

eventually have fewer issues with thatch, disease, fairy rings and annual meadow grass.

Symbio promotes healthy soils and their many benefits. We help clubs restore healthy soils by adding appropriate microbial species lost due to overuse of chemicals and synthetic inputs, and we encourage the use of biostimulants and organics to help nourish those microbes, allowing them to flourish. Our philosophy works well for the golf business, because it results in a better experience for members and guests. Reducing disruption from maintenance practices provides access to better playing surfaces for longer in the season. Aeration should continue, however we advocate substituting aggressive, disruptive works for regular micro-tining and mini-aerating. This delivers air and oxygen to soil microbes but also keeps golfers happy.

It is well documented that overuse of pesticides has dramatically affected soil quality in agriculture. As a society, we all want to minimise chemical use and look after the environment. Fungicide and pesticide use is limited if soil biology is healthy, which in turn reduces costs and the time associated with that task.

Healthy soil biology is part of your workforce. It works 24 hours a day, 7 days a week, every single day of the year to maintain golf courses without the need for aggressive disruption to play. Every week becomes 'Maintenance Week' when your soil biology is working well. Course closures due to maintenance are limited and revenue is optimised. In terms of cost, adopting a microbial approach to degrade thatch is generally more cost-effective than the physical alternatives, with

the additional benefit of keeping golfers satisfied. Adopting a natural approach is sustainable and cost-effective. The R&A's Golf Course 2030 initiative highlights the challenges you and your greenkeeping team face of maintaining playability while minimising the use of resources, including water, and managing the effects of climate change.

The creation and maintenance of healthy rootzones is pivotal to meeting these challenges and preparing golf for a sustainable future.

Natural soil is full of life and should support healthy growth, but we alter natural systems and processes with chemical and physical applications. The outcomes we're looking for can often come naturally. Maintenance tasks are necessary in order to deliver high-quality golf courses that are in use all year round, but we need to strike a balance.

Working with nature as a starting point is true sustainability. With that approach at the heart of a golf course management strategy, we deliver a cleaner, greener future for our courses, clubs, and the game of golf.

For further information, visit www.symbio.co.uk. Kerr Hunter can be contacted directly on **07966 786743** or email kerr.hunter@symbio.co.uk.





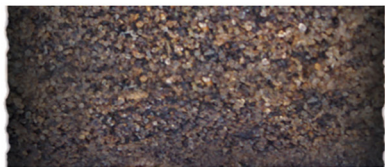
Thatch Layer

Holds water and harbours disease



Poor roots

Require constant fertilisation and irrigation



Iron Band

Iron-cemented layers form a barrier to growth and reduce water infiltration



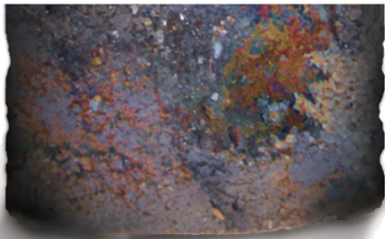
Black Layer

Anaerobic conditions and resulting accumulation of sulphides inhibit root growth



Compaction

No oxygen or space for root growth



Dead Layer

Sterile soil that cannot support life

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Problems associated with poor soil biology