Following on from last year's 'Testing Times' article which focused on top dressings, Mick Higgins and Peter Jefford of Rufford look beneath the surface and try to clear up the ambiguity and confusion surrounding the issue of rootzones

WHAT IS A ROOTZONE AND WHY IS IT IMPORTANT?

We all need a nice place to live. In order to thrive as human beings we need air to breathe, space in which to grow, water to drink and food through which to gain essential nutrients. And a grass root is no different - it needs an environment providing all of these elements if it is to grow and flourish. We call this environment the rootzone ie the layer under the sward in which the grass roots live and breathe.

The problems begin when this environment isn't right and this is mainly to do with the space (or pore size) between the particles of material that make up a rootzone, otherwise known as the total porosity. Porosity can be divided into two categories:

Capillary porosity refers to the smaller spaces in a material that fill with water – these are great for water retention but poor for aeration and can subsequently lead to slow drainage rates and weak, shallow root growth.

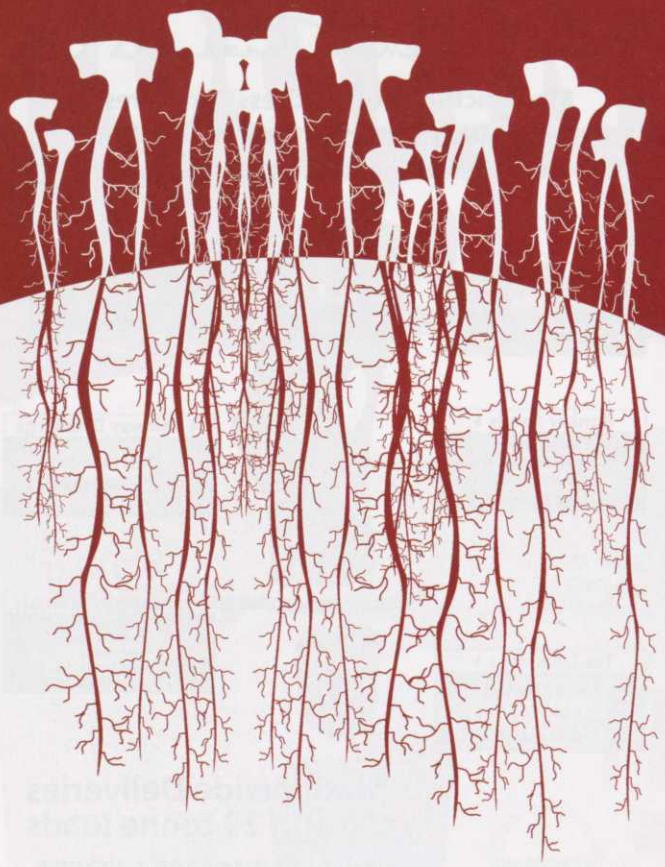
Non-capillary porosity refers to the larger spaces that are filled with air – great for aeration but poor for water retention and therefore may cause higher drainage rates and the need for frequent irrigation and fertiliser application.

The trick, therefore, is to achieve the right balance between the two.

A LITTLE BIT OF HISTORY

When golf started in Scotland during the mid 18th Century, greens were built on relatively free-draining dune sands - an ideal environment for grass roots and perfectly adequate for the needs of clubs at the time. But as the game spread south more inland courses were constructed using native soils to create what are often referred to as push-up greens. Initially, these early rootzones weren't too much of a problem given the relatively low volumes of course traffic back in those days.

But now it's a different story. Today's greenkeepers are faced with a much greater number of players, all demanding perfect playing conditions seven days per week under all conditions. These demands have been fuelled further by TV coverage via which players see the standard of championship courses throughout the year and develop similar expectations of their own club. All of which leaves the poor greenkeeper with a major headache in creating surfaces that can accommodate this demand. This is where a good rootzone plays a major role.



An example of a good rootzone profile

SO WHAT MAKES A GOOD ROOTZONE?

An ideal rootzone for healthy grass is natural soil and if you were building a lawn at home then this would be the first choice. But then you wouldn't anticipate hundreds of golfers walking over your turf every day of the year, even in saturated winter conditions. If they did then your new lawn would quickly turn into a mud bath!

Soil alone does not provide the drainage (or in the case of football and rugby, the stability) needed for a good commercial playing surface. This is basically because there is insufficient pore space between the particles in a compacted natural soil. Water drains through soil primarily via voids created by earthworms and particle aggregation. But excessive foot traffic and play quickly compacts these voids and subsequently slows drainage right down leading to a waterlogged profile.

Hence, to create a rootzone for commercial applications, an addition is needed and this comes in the form of sand, the physical properties of which provide the drainage and stability sometimes lacking in natural soils. This is because the space between sand particles (provided you use a correctly graded sand) remains even when compacted, hence allowing drainage.

And so a good rootzone is composed mostly of a well-graded sand together with the addition of an organic amendment (of which there are numerous forms but the most commonly used are soil, peat, compost etc).

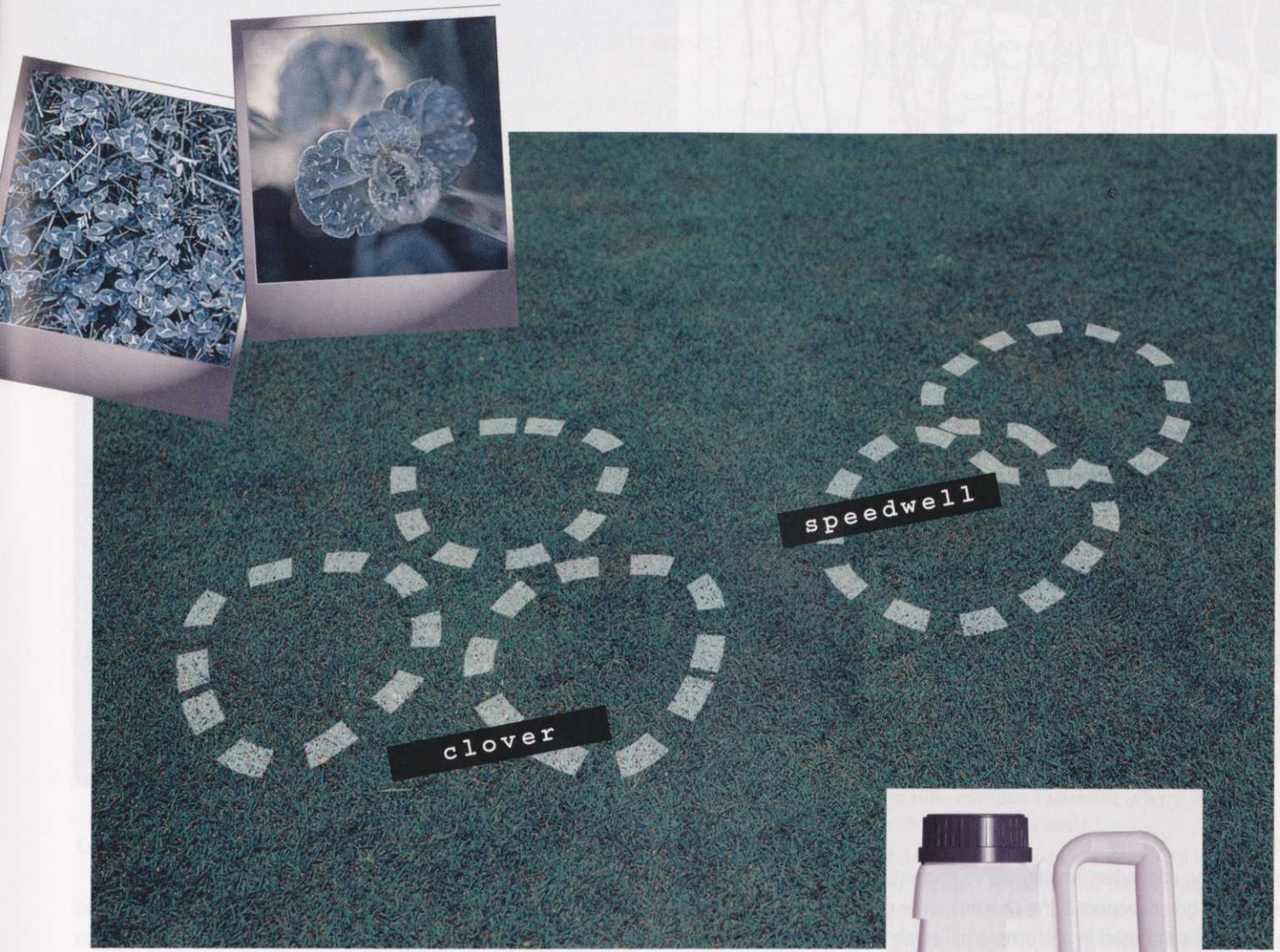
THE NEED TO SPECIFY

This does not, however, mean that you can use a blend of any old sand and soil. And asking for a 70/30 mix isn't going to help either. This specification tells you nothing about the physical properties of the sand in terms of lime content and grading, nor anything about the soil which could range from peat-based to a heavy clay content. Unfortunately you need to adopt a slightly more technical approach that takes into account such factors as:

- **particle size distribution** (the separation of sand grains into distinct diameter sizes)
- **silt and clay content**
- **saturated hydraulic conductivity** (the constant rate at which a saturated material is able to transmit water downwards - usually measured in mm/hr)
- **organic matter content**
- **pH** (or the acidity of a substance)

Unfortunately we don't have enough space here to go into detail about the implications of these factors, but suffice to say that each can have a significant impact on the performance of a rootzone. The important thing is to work with your rootzone provider to understand and establish your precise requirements. You can also find more information on our website at www.rufford.com.

So effective, it's a crime



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USGA construction

Mick Higgins at Chelford quarry in Cheshire, one of eight silica sand quarries owned by Rufford throughout the UK

COLOUR

A common misunderstanding we've encountered when speaking to greenkeepers is the concern some people have with the colour of sand used in a rootzone believing that it makes a difference to its performance. Believe us, it doesn't! Sand is obviously a naturally occurring mineral and colours are unique to each deposit/quarry. Technically speaking, the whiter the sand the fewer impurities it contains but this shouldn't influence how your grass grows.

USGA CONSTRUCTION

The current benchmark for putting green construction is laid out in the USGA Recommendations (1993 Revision). This utilises the suspended water table design which allows the surface to drain while still retaining essential moisture above a gravel layer. It is important to remember that USGA refers to the **whole** construction, from the particle size of the rootzone through to the grading and depth of the drainage gravel and the diameter of drainage pipes.

The individual elements of the USGA Recommendations only work to their full potential in conjunction with one another. And so there's little point having a USGA rootzone sitting on a clay bed rather than gravel. Similarly, if a green is constructed using a USGA rootzone of insufficient depth then the rootzone will not drain as designed and may even remain waterlogged.

ISSUES TO CONSIDER WHEN CONSTRUCTING A NEW GREEN

Green construction can be an expensive business and your club will need to think hard about the budget available before undertaking any construction project. But it's important to bear in mind that using inappropriate materials to cut initial construction costs could end up costing you more in the long run.

Once the green is built you obviously have to consider maintenance. Many greens are built perfectly well only to be ruined by the application of just any old top dressing. Construction is only the start of the story and, as we emphasised in our previous article, the top dressings you apply will add to and become part of the rootzone, eventually either altering or sustaining its physical (and to some extent biological) properties. This can result in the creation of 'layers' of the different materials used over time, which in turn can slow drainage considerably as the water is forced to pass through the varying particles and pore spaces of each.

CONCLUSIONS

While it may be out of sight, the rootzone really is the starting point of a good green and therefore can't be overlooked. Before commencing construction it's worth taking the time to think about your long-term performance expectations and sourcing a rootzone material that can help deliver these.

This doesn't have to (and shouldn't) be left to chance if you are sourcing materials from a reputable provider.

While there are many technical aspects to consider when choosing a rootzone, essentially you are looking to create (in conjunction with other construction elements) an environment in which grass roots will flourish through an optimum balance of air, space, water and nutrients. Achieve this and you'll be a long way to creating greens that will perform consistently in even the most demanding conditions!

You can find more information and technical advice at www.rufford.com

READY... but not Rough

ROLAND TAYLOR LOOKS AT THE DEVELOPMENT OF THE ROUGH MOWER

The first golf courses must have been virtually made up of 'rough' with small islands of relatively flat turf for the greens. This is a far cry from the modern course. The golfers who played these old courses probably spent a great deal of time searching for their lost balls.

In recent years it has been reported on a number of occasions that professional players in major UK tournaments have complained about what is relatively light rough. Many of the manicured fairways and virtually non-existent 'rough' that fill our television screens show very little signs of any vegetation or blades of grass out of place. Most of these are not in this country. The 'rough' is part of the challenge of the game, but they also have other roles. A fair amount of management is required so it is not just a question of mowing to a specific height, a few times a year. Recently, there has been more interest shown in developing these areas to provide habitats for our native flora and fauna. To this end the introduction of wild flowers is just one aspect that some clubs have adopted. For these projects to be successful a control mowing programme is required that ensures the rarer species of plants are not destroyed by more aggressive and invasive varieties.

IN THE BEGINNING

Looking back in history it is clear why the rough evolved. Up until the early 1950's, apart from a manual scythe, the only type of machine available, for cutting long vegetation, was a mower with a reciprocating blade system. Originally horse drawn it was adapted for the tractor and used mainly in agriculture for hay cutting and as a binder for cereals. Some courses probably used this method of controlling their rough areas, but as the only other alternative was to scythe it by hand, one suspects it was more often left. The fairways were kept open by firstly using horse drawn gang mowers and later tractor towed units or the larger self-propelled mowers.

ONE MAN WENT TO MOW

The rotary mower had first been introduced as a domestic machine just before the second world war but it was not until the early 1950's that it began to become established as an alternative method for mowing turf.

In this country the development of the rotary system was largely due to Douglas Hayter. From a small factory at Spellbrook on the Hertfordshire/Essex border he introduced his first machine, a 24" pushed rotary mower. The famous Hayterette quickly followed this, but both these units were aimed at the owners of large gardens with orchards. In talks with a Bishop's Stortford agricultural dealer it was decided to develop a tractor mounted rotary mower for use in orchards. Apple production was prolific along the Suffolk/Essex border and throughout Kent and Cambridgeshire so the potential market for this type of machine was encouraging. At this time golf courses were few and far between. A prototype machine was built around the little 'Grey Fergie' which was the most popular tractor for orchard work because of its size. At one of the Essex Agricultural Shows in the early 1950's Hayter launched their 6/14 tractor mounted rotary mower - the first of this type of machine in the world. It consisted of a PTO and belt driven 6-foot main unit with three rotary cutting heads. To this could be added wing units that then made the total width of the mower 14-foot. Swing-wings were also available which, when they came in contact with a fixed object, would fold back. This meant the machine could cut close to trees and fences.

Toro Groundsmaster 325-D out-front rotary mower

The 6/14 was an immediate success in the market that it was originally designed for - orchards. Large areas of long relatively dense vegetation could be mown down in a relatively short period of time and it was not long before other possibilities for this machine began it surface. One of these was 'the rough' on golf courses. Here was a method of taming these areas that was fast and easy. As with all things, it was not long before other manufacturers introduced alternative rotary machines and today there are plenty of these types of mower available.

READY... but not Rough

THE CUTTING SYSTEM

At this stage it is worth looking at the factors that make the rotary principle effective and efficient.

Its action is similar to manually using a scythe without all the time, sweat and energy this method requires. Blade revolving speed is critical for the finish and ejecting of the cut material. It must be at least 3,000 rpm, which means the blade tip will be travelling in the region of a 130-mph. There are a number of factors that alter this speed. Because the blade is generally working in dense growth the revolutions can slow down very quickly. This places a considerable loading on the engine. If the governors do not react immediately the drop off continues until the unit comes to a halt. The grass is torn rather than cut and flow of scythed material is not ejected so a blockage occurs in the system. This situation will occur when a machines cutting height is set too low for the crop being cut. Where the vegetation is long it is quicker and less stressful on the machine and the operator to mow it down in stages.

SHARPNESS

Another factor that greatly changes the mower's performance is the sharpness of the blades. A rotary will tear and hack down grass even when it is relatively blunt. This is highly dangerous and it places considerable strain on all the machine's components. Exhaust and noise levels plus fuel consumption increase rapidly. With a powerful tractor driving the mower it is easy to overlook the fact that the cutting mechanism may be blunt or damaged. Blades will need balancing after sharpening otherwise vibration occurs which, if left unchecked, becomes unsafe and will eventually shake the machine to bits

SCALPING?

Because the rotary blade works on a horizontal plane the question of scalping does often arise. Obviously, the wider the machine the more chance of this happening. To help overcome this problem there are mowers on the market that are made up of a series of small independently floating units each with their own cutterhead. These are said to follow the ground contours closely without scalping.

HEIGHT AND FREQUENCY

The correct cutting height is important. Some users discovered early on that regular rotary mowing would, over a period of time, produce a lawn type finish, especially where machines are continually set low. This aspect is particularly important when managing wild flower and plant areas. They require a different schedule to that of cutting the 'rough' that is only being maintained

Lastec Articulator

at a specific height. The mowing frequency is probably less and at certain times of the year, for instance, in the case of bulb areas, these are best left until after all the foliage has died down which is generally sometime in June or early July. In the case of wild flowers mowing usually takes place after the flowers have seeded. In both these examples the cut vegetation needs to be removed.

COLLECTING

There are plenty of rotary mowers available with collecting facilities, but the thing to watch out for is their efficiency in performing the operation. A yardstick to use when looking for this type of machinery is check the size of the outlet aperture and how many obstacles the cut matter has to travel through or over before it reaches the collector. The shorter the distance between blade and the rear of the box and the bigger the opening the better. Vegetation is not always dry and if very wet it can quickly block up a collecting system so you need a machine that will efficiently collect in these conditions.

FLAIL

The flail mower is an alternative method of mowing rough areas. They use a series of flails or knives mounted on a drum. Again, speed is important to the machine's efficiency, mainly because flails are not cutting against a fixed blade; they are travelling vertically into the vegetation. This absorbs a lot of engine power. The action of the cutting mechanism tends to lift the cut material and throw it backwards hence the reason that flails generally have a rear collector. Compared to a rotary a flail tends to be slower, but will often take denser amounts of matter such as heather. The smaller units on long reach arms are excellent for getting into confined spaces and mowing banks and ditch sides.

John Deere 1600 Turbo

Blade balance is critical, and any damaged flails should be replaced as soon as possible. The drum is mounted on bearings and if it becomes unbalanced, the vibration that occurs will quickly damage the machine and make it highly dangerous. Cutting height is also important. If it is too low the same effects will occur as they do with a rotary and the chances of scalping are increased.

GANG MOWERS

Some rough can be, and probably is, mown using gangmowers. These usually have fewer blades in the cylinder than those used for cutting fairways. As with all cutting mechanisms how sharp they are is the major factor. As this type of system is likely to take a fair amount of hammering it should be checked at regular intervals for any signs of damage or wear. Back lapping is only a temporary measure and at the earliest possibility the cylinder and bedknife will need grinding.

READY... but not Rough

New Holland MC35

COMPLETE PICTURE

Often a course is an oasis in an intensive agricultural or suburban landscape and 'the rough' is the dividing lines between where man made and maintained areas meets nature and a haven for flora and fauna. It is like a frame round a picture, with the tees, fairways and greens as the subject. If presented right the contrast enhances the appearance of the course. With the machinery now available, this is relatively easy to achieve, so it is worth spending time shopping around to ensure you find the right ones that match your specific requirements.

Thanks to Ray Goodsall, Course Manager at Saffron Walden GC, for his co-operation in the taking of the photographs.

Jacobsen HR-4600 Turbo