Arriving at the Bowood Estate, which lies a few miles west of Chippenham in Wiltshire, felt like accidentally stumbling across the set of 'Downton Abbey' – and I half expected to be summoned for afternoon tea by the Marquess.

The spectacular 4000 hectare site boasts a famous Rhododendron Walk, a secret garden and an 18th century House. The proprietor is Charles Maurice Petty-Fitzmaurice, the 9th Marquess of Landsdowne – Bowood has been his family's home for nearly 300 years. But my visit concentrated on the serious work that's been taking place on the superb golf course.

Brisbane-born Jaey Goodchild is Head Greenkeeper at Bowood Golf and Country Club which covers around 200 acres of the huge site. It's 18 holes of glorious parkland and a former Challenge Tour venue which measures an intimidating 7,309 yards from the blue tees and 6,878 from the white.

Jaey said: "It's picture postcard stuff – just what you would expect one of Capability Brown's works to be. But it's very much a working Estate - there's a gamekeeper and a sawmill with on-site carpenters. In fact the wooden posts for our yardage signs have been sourced from seasoned oak felled on site."

Jaey came to Bowood in 2011, and his immediate aim was to improve the USGA greens which at that time had a high thatch content and high incidence of disease. When the team used to core, the greens suffered major pull-ups due to the lack of surface stability. The sward was weak with minimal rooting and they would spend hours repairing the greens after aeration.

"My first big challenge was convincing the proprietor, committee and members of the importance of curing this and find a way to fit it in to the schedule. This was difficult in the first year because I started in March when most of the year's business had already been booked. So year one had to be a real 'little and often' approach to keep things ticking over with plenty of fine aeration and light topdressing.

"We schedule two hollow tining operations per year plus multiple micro solid tines and winter slitting. Last year we aerated the greens 14 times and always follow up with a light topdress, brushing and rolling to get the surfaces back on track.

"We're giving the roots the opportunity to develop, bind the sward together and strengthen it. Now we've every confidence we'll have zero pull-up when we aerate.

We've kept it simple – get the air in there and get the sand in there, little and often, and we haven't tried anything too fancy. We're at a point now where we can aerate, roll and have play that day and golfers don't even notice we've done it."

Bowood had 940mm rainfall last year, 20% more than average, and the renovated greens stood up well remaining largely firm and dry. But the moisture did lead to more problems with disease.

"We had Fusarium in July which you would never expect, quickly followed by Anthracnose, so managing two diseases in such a short space of time made it a tough year. Even this year the Fusarium has been lingering because of the humidity – not so much that you take action but definitely enough to keep an eye on."

The greenkeeping team comprises of nine full-time staff plus some seasonals through the summer. This includes one mechanic – however he's kept busy with jobs on the rest of the Estate as well as maintaining the greenkeeping team's fleet. There are also eight gardeners looking after the spacious gardens, arboretum, the Rhododendron visitor centre, adventure play park and the myriad other attractions on site. So how does Jaey ensure that the greenkeeping team's work is integrated with the rest of this large commercial operation?

"We plan a year in advance. If we want to do renovation work in the spring I book it in the previous August and all our customers are made aware of it in good time. We have a members liaison committee who I address on a regular basis. I always start off with the weather followed by a course report, then I update them on upcoming work on the course and we finish things off with a Q&A. I report to both the Hotel Manager and the Estate Manager, and subsequently to the Marquess, but on a daily basis I work very closely with the Hotel Manager and Head Pro."

In common with my recent features on larger courses with budgets to match, Jaey realises he is fortunate to be able to call on the services of a greenkeeping team nudging double figures.

He said: "It's only possible to keep to the 'little and often' plan on this site if you have a decent sized team, and I'm fortunate to be in that position. We've also invested in new machinery which has cut the time it takes to complete these key tasks.

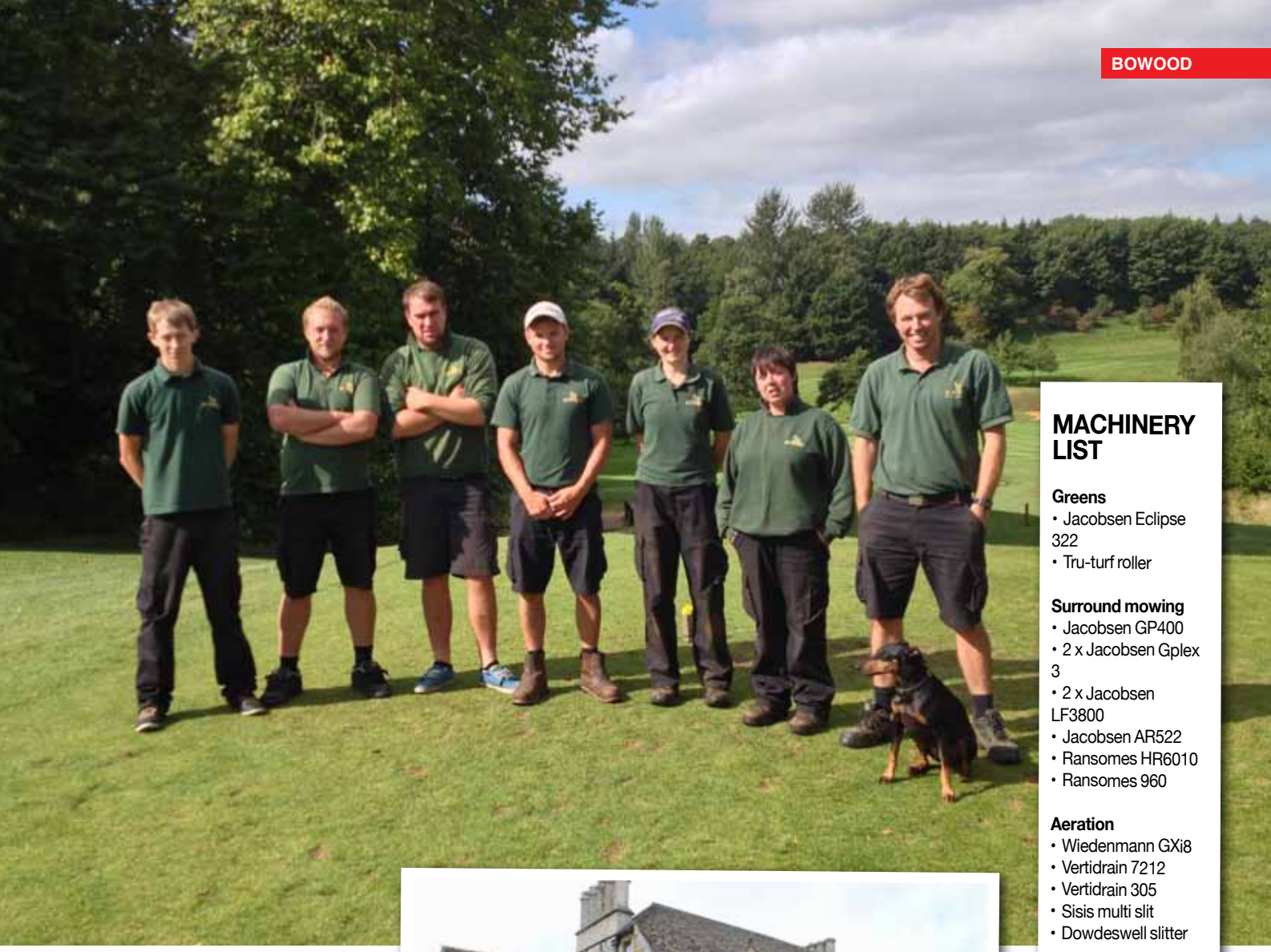
"We've got a massive amount of long rough. We cut and collect annually at the end of every season, and we're gradually scarifying to thin out the heavy play areas"

"The key piece of kit for me is the Wiedenmann Terra Spike GXi 8. The old machine was only 800mm wide so it took a long time to do the job! The Wiedenmann's speed and versatility make it crucial, and it's got all the bells and whistles – it does whatever you want it to do. We also use a Sisis multislit that can buzz round a hectare of greens in a couple of hours – that's vital because we've got a hectare and a half of green surface."

The course itself is undulating, with long rough (almost reminiscent of some links courses) punishing errant drives. It looked picturesque in the summer sun, with a young

ABOVE: Harvested rough bailed and ready for removal

MAIN RIGHT: The team at Bowood - Jack Summers, Lee Whyte, Zac Broocks, Matt Law, Franzi Iten, Sam Day, Jaey Goodchild



deer skittering down one of the fairways as we drove round. With the team now in control of the USGA greens, they've been able to focus on management of the long rough.

Jaey he explained: "We've got a massive amount of the stuff. We cut and collect annually at the end of every season, and we're gradually scarifying to thin out the heavy play areas.

The hardest part is finding the balance between aesthetics, economics and speed of play. There's a lot of arguing – sorry, I mean cooperation between myself and the pro Paul McLean on this! We spend a lot of time together every spring on cut lines, watching play and managing it all."

Jaey first arrived on these shores in December 1997 on a six-month backpacking trip - and has stayed ever since! His first job in the UK was landscaping at Hyde Park for two years. This involved spending many hours with the Park's fine turf specialist which convinced him that was the path he wanted to follow.

His first golf role was at Chobham in Surrey as an Assistant, before moving up to a Deputy role after only 18 months. Two years later he secured a role at The Richmond as a Deputy. All of his turf education was in the UK. He attended afternoon and evening classes at Merrist Wood to obtain a HNC & HND, before completing his Masters Degree in Sports Surface Technology at Cranfield University – a total of seven years of part-time study. He's been a BIGGA member for 11 years, and is also a Silver Key member. Why?

"BIGGA's education programme has opened so many doors for me over the years so it's good to give a bit back. Most of the guys here are BIGGA members and I try and get them to attend as many events as possible – seminars, golf days, BTME - rotating them so they all get a chance.

"I've been a regular member of the BMW PGA Support Team at Wentworth and also The Open this year for the first time – these are fantastic opportunities – there's such a buzz when you're working at a tournament."

In a disappointing sporting summer for Australia (sorry Jaey, I couldn't resist…) it's pleasing to see one Antipodean enjoying success in the UK.

MACHINERY LIST

Greens
- Jacobsen Eclipse 322
- Tru-turf roller

Surround mowing
- Jacobsen GP400
- 2 x Jacobsen Gplex 3
- 2 x Jacobsen LF3800
- Jacobsen AR522
- Ransomes HR6010
- Ransomes 960

Aeration
- Wiedenmann GXi8
- Vertidrain 7212
- Vertidrain 305
- Sisis multi slit
- Dowdeswell slitter

Bunker rake
- Smithco Superstar

Spraying
- Hardi 6m truck mount
- Hardi 12m tractor mount

Debris clearance
- Tornado XL360
- Amazone GHS210
- Ryan core collector

Utility vehicles
- 3 x Toro HDX Workman
- Cushman
- Kawasaki Mule
- Easi-go

Topdressing
- Ultra spreader topdresser
- Toro 1800 topdresser

Extras
- Bernhard Grinding Equipment Express Dual 2000, Angle Master 2000
- Groundman sodcutter

In the first of a two-part series, Steve Isaac, Director of Golf Course Management at The R&A, describes the successes and failures of five clubs aiming to achieve better year-round putting greens

A better environment ...**the key** to better greens

In June 2006, The R&A employed the STRI to undertake a project which ran for six years with the purpose of following the impact of a maintenance package aimed at producing firmer, healthier greens at five golf clubs in England.

The selected courses, which could all be considered to fall within the parkland designation, volunteered to take part in this project and STRI agronomists made their first visits later that year.

The programme concluded at the end of 2012 with a final agronomic visit.

In the interim, STRI agronomists visited each course twice a year and gave advice with a view to producing healthier turf and drier, firmer putting surfaces, thus developing an environment which favours the desirable browntop bent and fine fescue grasses. Objective tools were used to assess progress in terms of putting green firmness, trueness, smoothness, speed and soil moisture content, though this was restricted to the last three years of the project as the STRI Programme was not available before then.

After six years, all clubs noted improvements in year-round putting surface performance and, especially, winter play. Collected data showed the development of firmer, more consistent surfaces with enhanced drainage which suffered less from climatic stress or disease incidence.

Reduction in thatch was not as significant as had been hoped, not helped by a series of wet summers and difficulty in achieving the recommended works necessary to make a real impact.

Consequently, increases in the finer grasses were not, generally, as notable as expected but some clubs have seen clear evidence that this is happening.

Firmness did increase over the period – suggesting that there is not a simple relationship between firmness and the percentage of organic matter at any given depth below the surface; the structure of the thatch, how well it is diluted, its homogeneity and water-holding capacity are important factors which are not drawn out from a laboratory test of organic matter content.

The results firm up attitudes to green management.

MAIN LEFT: David Croxton, pictured right, reviews progress on the Cold Ashby greens

MAIN RIGHT: Golfers putting out on the firm er Knowle greens

INSET LEFT: Firmer surfaces at Cold Ashby but still a long way to go to control organic matter

INSET RIGHT: Although still averaging 12% organic matter in the top 0-20 mm, the healthier rootzone is producing better greens at Knowle

RIGHT: The shaded 7th green at Leek

Coming Soon...

Steve goes through the do's and don'ts of working towards a healthier environment.

Cold Ashby Golf Club, Northamptonshire

A proprietary club, Cold Ashby achieved a 33% reduction in nitrogen input, from 175kg per hectare to 115kg per hectare per year, with healthier greens as a consequence. Bent content increased by around 10%.

Their greens dipped in and out of the objective assessment target ranges, suggesting organic matter content well above the desired level, averaging at 16.9% in the top 0-20 mm as opposed to the target range of 4-6%, remains an impediment to consistent surface performance.

David Croxton, Course Manager at Cold Ashby, made the salient point that his involvement in the project had been "a successful exercise that required a great deal of commitment on all sides." He added:

"It would have been easy to give up after three years but, in retrospect, that would have been a mistake.

"It was probably a valuable learning experience for both the advisor and the club."

Knowle Golf Club, Bristol

At Knowle, a private members club, all greens are now within the target range for hardness whereas they were soft at the start of the project.

Smoothness has improved markedly, with this measure and trueness now hitting the 'Routine Target' range.

At the start of the project, annual meadow-grass was very much the dominant grass on the greens (averaging 66%). Bent grass is now on a par or present to an even higher level than annual meadow-grass, with greens averaging 56% bent content.

Ryan Coles, Secretary/Manager at the Club commented: "Although making a mediocre start due to internal problems, we have certainly moved forward in the last three years and are now seeing major progress being made. We've worked hard to communicate our aims to our members and to raise their awareness of what we are trying to do.

The majority understand that some short-term disruption to play is needed from time to time and this patience has been rewarded as the greens have received many plaudits from the membership.

"Due to the general economic climate, these are difficult times for members' golf clubs such as Knowle. It is not easy to correlate the link between the condition of greens and our membership levels, where of course we derive the vast majority of our income. It's fair to say we're not losing members to other golf clubs and a significant number of those joining us are established golfers from other clubs."

Leek Golf Club, Staffordshire

The green to the par 3 7th hole at Leek, a private members club, sits under a row of tall Leylandii which protect the car park from balls flying to the left of the green. At the start of the project, the green was soft, wet and dominated by disease-prone annual meadow-grass.

Thanks to the installation of drainage and a thatch dilution programme it is now a firmer (from below 70 gravities to consistently within the 80-100 gravity target range), drier, smoother, truer and faster putting surface.

Generally, Leek saw an increase

in hardness from below their target range to above this range over the course of the project. This represents an improvement of 43%, and could well be a result of their 10-15% reduction in volumetric soil water content. By the end of the project, Leek had hit or was much closer to target ranges for hardness, soil moisture content, organic matter content at 40-60 mm, smoothness and green speed. The result was the production of greens that were firm throughout last year's very wet summer and last winter. Leek kept play on the greens throughout this period, except for when there was an overnight frost or snow cover.

Head Greenkeeper John Turner reflected: "From Leek Golf Club's point of view, participating in the project was a huge success. The Clegg Hammer and the Moisture Meter are very useful tools for monitoring the greens firmness and soil moisture content, but collecting the data was something of a challenge at times. With a small staff and me as a working greenkeeper, I had to rely on the goodwill of our Greens Chairman to do the majority of the data recording.

"The readings showed up some interesting results which went a long way to resolve certain issues and highlight others. Leek's involvement in this project was crucial for me to confirm to the club that the practices I had put in place on taking over here were the correct way to push sustainability and its objectives forward to what, I am happy to say, has proven itself in terms of all year round good playability."

STRI Agronomist, Paul Woodham, added: "Leek Golf Club has reaped the rewards of their hard work and desire to improve the performance of the greens which are now amongst the very best I see. Their ambitions and objectives are now to move forward from a position of strength, progressing in a sustainable manner which is the envy of many other courses".

The South Buckinghamshire, Stoke Poges

This council run municipal course has seen nitrogen inputs reduce by 20% and hardness has increased so that figures now fall within the target range. Green speed has improved and is close to the target range, whilst height of cut has not gone lower than 4mm. Although still at a relatively low level (10-26%), bentgrass content has risen from starting values of 1-6%.

Paul Frost, Head Greenkeeper, commented: "Being part of the trial has been a great opportunity for the staff, council and golf course alike.

"The greens have improved greatly and this is backed by customer satisfaction surveys and retention of returning golfers. We will never know how much influence this has on revenue but I feel that the condition of the greens does play a major part in golfer satisfaction here.

ABOVE: Tree thinning and removal of undergrowth has brought about an improvement to the 6th green at The South Buckinghamshire

RIGHT: John Turner, left, taking objective measurements of the 18th green at Leek with the Club's STRI agronomist, Paul Woodham

INSET MIDDLE RIGHT: Paul Frost stands proudly outside the new maintenance facility at The South Buckinghamshire

BELOW RIGHT: Wilmslow Course Manager Steve Oultram, discuss progress with Andy Fluck

BELOW LEFT: The still shaded 14th green at Wilmslow has shown great improvements in year-round playability following tree removal and drainage

"Winter play has improved hugely due to the greens' ability to be in play much sooner than previously after heavy rain. This used to close the course sometimes for a day or two, but now we can get the greens playable in a fraction of the time."

Putting the resources available to him into context, Paul added: "There are only seven staff, including myself, looking after three facilities; the golf course, a golf academy and a large multi-sports ground. This, and the weather over the summers of 2011 and 2012, has impacted on the amount of aeration, top dressing, etc, delivered to the greens. With more resources the greens may have been much more advanced than they already are."

There are encouraging signs for the future with a major investment in infrastructure at The South Buckinghamshire.

A new £350,000 maintenance building has opened, and a £1.65 million clubhouse which will be able to host non-golf related functions is under construction. Golf is in good hands at The South Buckinghamshire, with the Academy driving the recruitment of new golfers and preparing them for the challenge of the main 18 hole course.

The Wilmslow Golf Club, Cheshire

Spring smoothness was an issue at this private members club, as for most UK courses with a mixed sward.

Over the course of the project this has improved to all greens, and is now almost within the target range. There is also much greater consistency in performance between greens. Micro-managing has led to improved consistency.

Trueness and green speed measurements at Wilmslow are mostly now in the 'Tournament Target' range.

It is very likely that this is a consequence of the low organic matter content figures recorded on the greens, plus improved drainage, and should suggest to other clubs across the country that they need to get down towards the STRI target range for organic matter (4-6% in the top 0-20mm of a soil profile and less than 4% lower down) in order to attain such a performance standard.

The 14th green started out as a shaded, wet green, dominated by a weak annual meadow-grass sward. Removal of trees and the installation of drainage resulted in a much healthier green with an increased proportion of browntop bent (8% more).

Andy Fluck, a Member of the Green Committee, reported that: "There has been a notable improvement in winter playing quality and consistency between greens.

Pressures were noted to green quality during the difficult early spring period and further advice was instrumental in being able to deliver stronger earlier growth as the season commences with the use of different inputs and fertiliser.

The clear message that came from our involvement was that it is essential to correctly identify the main limiting factors to progress of growth such as shade, poor or failing drainage, on a green to green basis and within separate areas on each green.

The regime of data collection and analysis enabled us to make informed decisions from what is fundamentally an early warning system."

The future

All of the clubs involved have expressed their intention to carry on with the programme that has been devised over the duration of the project, i.e. reduced inputs and maintenance set to hit target ranges for organic matter content, soil moisture content, hardness, smoothness and trueness.

Summary

Golf clubs have facing increasing pressure during the economic downturn. Making savings through a more sustainable approach to greenkeeping is only attractive if it also brings better playing surfaces for more of the year and the chance to increase revenue, thereby giving them more of a chance to at least retain members and visiting golfers.

about the author

Steve Isaac

Steve Isaac was an agronomist at the Sports Turf Research Institute (STRI) for 17 years. He then became responsible in 2003 for The R&A's golf course sustainability programme, working to protect the enjoyment of the game and to safeguard the financial operations of golf facilities, in a manner which preserves natural environments and enhances community engagement.

The wet summers of 2011 and 2012 limited the amount of top dressing that could be applied to the South Buckinghamshire greens The wet summers of 2011 and 2012 limited the amount of top dressing that could be applied to the South Buckinghamshire greens

Changing face

Dr Terry Mabbett speaks to various industry experts to analyse how anthracnose has changed, how to deal with it and how it can be one of the downsides of good summers

Close up on basal rot anthracnose in a Poa sward (Picture courtesy Syngenta)

Lengthening shadows and falling leaves were the traditional signals for anthracnose as a dark coloured basal rot on Poa annua caused by a thatch-residing Colletotrichum fungus.

Anthracnose on turf was originally assigned to Colletotrichum graminicola but scientists more recently named Colletrotrichum cereale as the main culprit on turf. The change is minor compared to the overall changing face of anthracnose on UK turf since the 1990's. Radical new dimensions encompass a wider range of turf grasses, different disease symptoms and a new time frame.

New disease dimension

Anthracnose now appears as a foliar blight in summer on a much wider range of species. North America has a long history of foliar blight during spells of high humidity with temperatures over 22°C, especially on seasonally stressed turf struggling to grow over a dry root zone. Annual meadow grass (Poa annua) and creeping bentgrass (Agrostis stolonifera) are the prime targets, but smooth stalked meadow grass (Poa pratensis) and creeping red fescue (Festuca rubra) are also affected.

Summer showers and irrigation is repelled by the dry compacted surface of the root zone. Accumulating surface moisture has nowhere to go but into the thatch. Moistened within an envelope of high humidity the conditions are now set for fungal growth, spore production, infection and the rapid onset of foliar blight.

A remarkably similar pattern has evolved in the UK with anthracnose appearing as foliar blight on turf stressed out by high traffic and lack of moisture to cause dry compacted root zones and visibly stressed out grass plants.

Overall, annual meadow grass is the most susceptible species but as Dr Simon Watson of Syngenta told Greenkeeper International, "the foliar form of the disease affects most turf grass species, including bentgrass and fescue."

Foliar blight is the downside of good summers. "Anthracnose appears to have been quite a widespread problem this year", says Joe Kinder, Technical Manager at Sherriff Amenity. "It's likely this reflects the harsher growing conditions associated with good summer weather."

Traditional autumn anthracnose only posed problems for greens with a high proportion of Poa. As a thatch residing fungus responding to classical autumn conditions of cool temperatures, morning mists and dew, basal rot anthracnose tended to occur alongside Fusarium Patch.

Fusarium was easily the number one disease of UK turf so fungicide sprays were almost entirely targeted at the causal fungus Microdochium nivale.

Rarely did anthracnose appear on fungicide labels for managed turf although everybody from chemical companies to greenkeepers knew most products with Fusarium on the label would 'do for' anthracnose at the same time.

According to Peter Corbett, Chemical Specialist at Rigby Taylor, the absence of anthracnose on labels was due to a combination of factors related to logistics and economics. The sporadic, localised nature of anthracnose meant it was difficult to find suitable trials sites and for the same reasons essentially uneconomic to conduct them, for anthracnose as a 'stand-alone' disease.

Greenkeepers striving for Poa-free greens actually welcomed a disease that would selectively clear out annual meadow grass. They saw basal rot not as a destructive disease, but as a useful biological control agent, a naturally occurring and operating mycoherbicide helping to maintain Poa-free swards.

"When I started in the industry over twenty years ago it was generally called 'annual meadow grass dieback' and was regarded by some as the greenkeeper's friend" says Henry Bechelet, Technical Sales

# of anthracnose

Manager at Everris.

"These days anthracnose is an altogether different proposition and can cause significant damage if left unchecked. It seems that the increased pressure of ever more intensive management, coupled with greater demands for play and combined with ever more extremes of weather are creating conditions for the disease to flourish and strike harder and harder."

New order management

A new disease dimension calls for a new order of disease management with a more integrated consideration of the causes and the control of anthracnose. More emphasis is given to summer stress facilitating easier and quicker leaf infection and disease development, and environmental conditions that push a sedentary saprophytic thatch residing fungus into full parasitic mode.

Rising temperatures over compacted turf with dry patch symptoms is a 'flag up' for anthracnose. Moisture from summer showers or irrigation with nowhere to go except into the thatch will create and maintain surface wetness and high humidity, the ideal conditions for pathogen activity and anthracnose disease.

Wetting agents to improve soil permeability and water holding capacity, to avoid dry patch and maintain stress-free turf in summer, clearly have an important part to play in anthracnose management. Discussing the advantages of their Tricure range of wetting agents in last month's Greenkeeper International, Headland Amenity specifically cited the need "to get water into the root zone and keep it there to reduce the stress associated with turf diseases such as anthracnose."

Dry compacted soil also impacts on fertility because applied nutrients can only enter the root zone and be accessed by roots when in solution. Other fertility concerns related to anthracnose revolve around contemporary trends in overall fertiliser use.

Abrasive aspects of anthracnose

Aeration and scarification employed to avoid and alleviate stress can actually aggravate anthracnose especially when used during high risk periods. Anthracnose is also aggravated by traditional summer practices such

ABOVE: Anthracnose is now a disease 'in its own right' requiring targeted control in summer to manage the foliar blight form on a range of turf grass species

RIGHT: Close up on dark coloured basal rot damage on Poa annua plants (Picture courtesy Everris)

ABOVE RIGHT: Aeration should be carried out during low risk periods for anthracnose (Picture courtesy Syngenta)

RIGHT: Anthracnose can cause considerable scarring across the greens (Picture courtesy Syngenta)