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# Green solutions for greenkeepers

Golf clubs are under increasing pressure to save energy and conserve water in the course of their greenkeeping operations. Paul Shute, highlights the role that new technologies can play

**Golf clubs can be conservative institutions, used to implementing similar policies and using the same technologies in their greenkeeping operations year after year.**

The procurement process often mirrors this conservatism. Traditionally, the Course Manager puts in a request for a new piece of equipment, such as a pump, and the Green Committee signs it off without any real discussion, due to the fact that the Committee is, naturally, made up of golfers not agronomists.

However, there are increasing signs that times are changing as a number of different pressures come to bear on golf clubs across the UK.

These pressures are interlinked, pushing clubs and greenkeepers to embrace new ways of working and forcing many to consider the issue of sustainability for the first time.

The first pressure is operational costs. As golf club memberships fall, committees are coming under increasing pressure to keep running costs down.

A major contributor to those running costs is the myriad of pumps and pipes which feed sprinkler systems alongside fairways and greens.

Each pump is electrically driven and during summer months can be in operation for many hours every day. All of this contributes to a considerable running cost, particularly when rising electricity prices are factored into the equation.

The second pressure is the threat of water bans, which after a dry summer and exceptionally dry winter has left many water companies already fearful of perilously low reservoirs and underground aquifers. What's more, commercial

organisations with water meters, which are now the majority, and that includes golf clubs, are faced with paying for every drop of irrigated water poured onto the course. A dry summer, which cannot be ruled out, could leave many golf clubs with the double whammy of paying high prices for a scarce resource.

So what can be done? In recent years the rise in running costs in particular has begun to lead many golf clubs into embracing two new technologies which together can begin to turn back the clock of rising costs.

## **Variable Speed Drive Pumps (Hydrovar)**

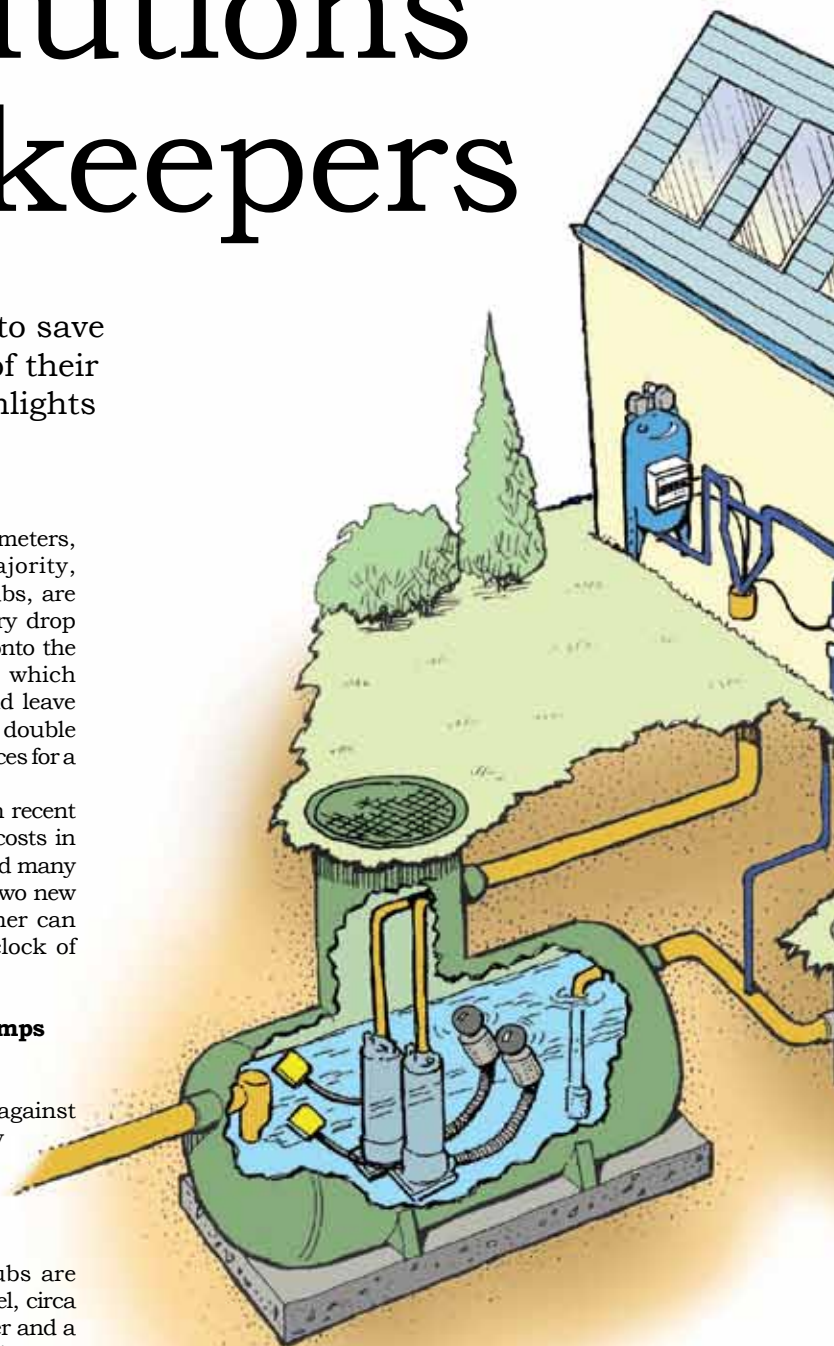
One way of mitigating against the rising cost of electricity is for greenkeepers to incorporate the use of various speed drives into their pumping systems.

Typically, most golf clubs are equipped with a large vessel, circa 500 litres, to keep the water and a fixed speed booster set which starts the pumps at a lower pressure, cutting in at approximately 3.5 bar and cutting out at approximately 4.5 bar. Most clubs will be equipped with up to four pumps within this type of system.

There are two key issues. Firstly, all pumps are usually 15-20% over-sized in terms of the application.

System designers will always choose the next size pump in the range to ensure there is enough capacity, but then the distributor often compounds the problem by going up a further pump size again.

The second problem with this sort of system is that the large pumps have to run flat out when the sprinkler system is turned



on regardless of demand. This is clearly not energy efficient.

In particular, starting and stopping a pump consumes a lot of energy. Most pumps require five times the full load current to begin rotating. For example, a 10 amp pump will take 50 amps to get it turning.

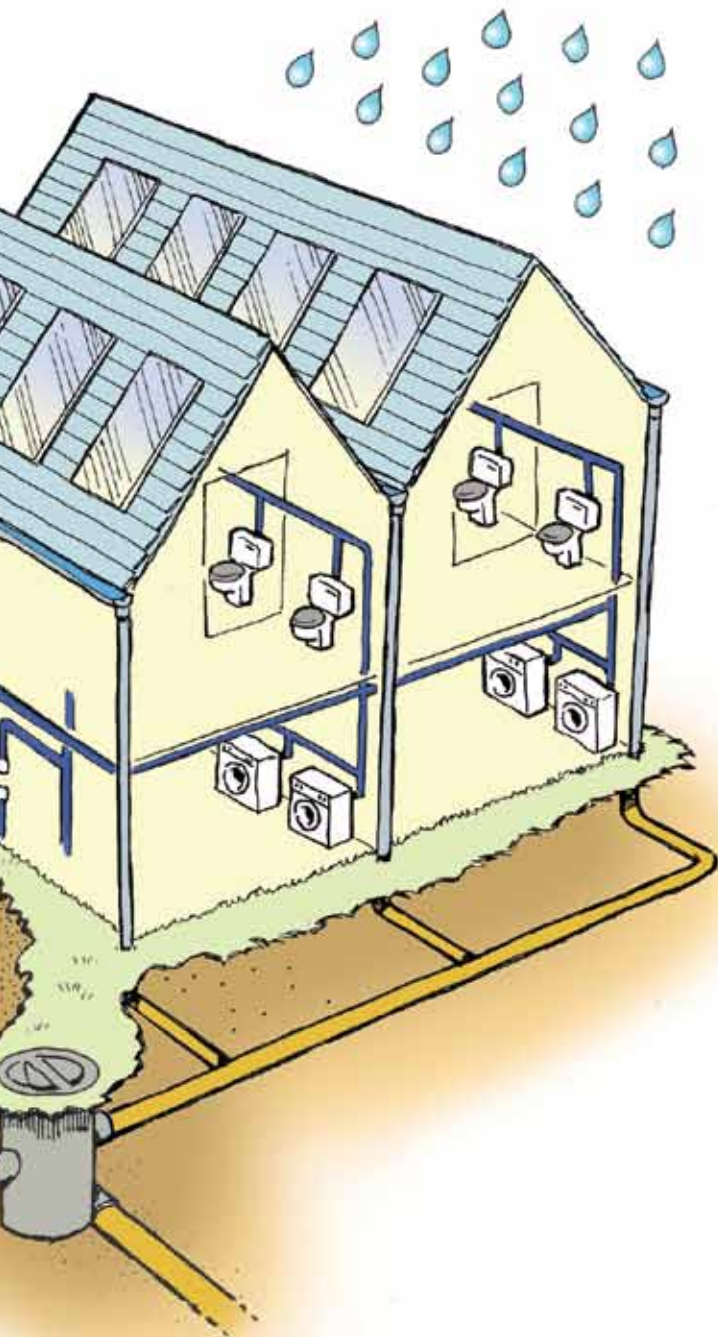
The answer may lie in the use of variable speed drives (VSDs) which ensures that the pump never has to run faster than it needs to. Crucially, this type of equipment can now be retrofitted onto existing centrifugal pumps.

VSDs work by monitoring output



Paul Shute is the Variable Speed Drive Specialist for Xylem Lowara. For more information, please visit us at [www.xyleminc.com](http://www.xyleminc.com)





pressure. If a golf course requires three bar pressure on a pump's output, the unit will run the pump at a speed to maintain three bar pressure and no more.

In other words, it never runs the pump faster than it needs to.

For example, a seven kW motor running at a 50 Hz cycle will use seven kW per hour of power. The same motor running at only 40 Hz will use half the kW power, namely 3.5 kW. The same pump running at 30 Hz will use only 1/7th of the power, namely one kW.

If, therefore, the pump is running at 10p per kW hour, the seven kW pump running at full speed cost is 70p per hour. The same pump running at 30 Hz will therefore only cost 10p per hour.

Crucially, variable speed controllers, such as the Hydrovar which is manufactured by Lowara, can be mounted or retrofitted to any

of rainwater as have Maintenance facilities.

With a rainwater harvesting system, rain is collected via the normal rooftop collection system which would normally then go straight into the drains. Instead, the downpipe is diverted to carry the water through a Vortex filter to get rid of any debris.

Around 95% of the water collected is then stored in a collection tank.

As water enters the collection tank it passes through a calmed inlet which calms the inlet flow of water and prevents disturbing any sediment that may build up on the bottom of the tank.

There are a number of fail-safes built into commercial rainwater harvesting systems.

When water is at minimum levels in the tank, after a period without rain, an integral probe set and

## “One way of mitigating against the rising cost of electricity is for greenkeepers to incorporate the use of various speed drives into their pumping systems”

existing pump manufacturers unit which is equipped with a standard IEC motor.

Experience suggests that the retrofit option can bring pump speed down to circa 40-42 Hz and pump users can experience savings of circa 50 per cent on their normal pump running costs.

### Rainwater harvesting

The second sustainable technology that greenkeepers can consider is rainwater harvesting. This is not a new idea, the traditional water butt has been in use to water domestic gardens for many years, but technology and water meters are increasingly bringing this idea into commercial applications and golf clubs are a key target market for manufacturers.

What's more, the time is right for golf clubs to embrace this technology. Many clubs are increasingly asking themselves the question: why irrigate with clean drinking water when we can use grey water which has been harvested and recycled to save ourselves some money?

Crucially, golf club premises provide the perfect environment for rainwater harvesting systems. Clubhouses have big roofspaces capable of collecting large amounts

transfer pump, with floating suction filter, ensures that water is only collected from the cleanest parts of the storage tank.

During periods of low rainfall, when the collection tank may become depleted in this instance the top up solenoid will be activated by float switch sensing a low level in the collection tank.

The solenoid will open and pass mains water through a type AA air gap to ensure compliance with current water regulations.

When rainwater is available again after a period of rainfall the storage tank will revert to replenishing from the collection tank.

Storage tanks for rainwater harvesting systems are available in multiple sizes from small circa 1,200 litre tanks up to 12,000 litres. However, greenkeepers should not be inhibited by standard sizes. Many systems, such as the Lowara AirRain, offer bespoke tank sizes to suit all applications.

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# Turf pest creatures

A series of articles aimed at a varying readership.

## Entry Level

This month, if you are new to greenkeeping, read on...

# great and small

Dr Terry Mabbett takes a look at all things not so bright and beautiful

**What's most surprising about animal pests of professional turf is why any predator of green plants would bother with close-cut grass with so little above ground to feed off.**

Indeed this is why the two major insect pests of turf in the UK are essentially subterranean problems. Chafer grubs and leatherjackets the larval stages of chafer beetles and crane flies, respectively, feed on and damage turf grass roots.

The first thing to say about the pests of professional sports turf, in the UK, is that golf courses here get off relatively lightly in comparison to those elsewhere and especially courses in North America. But that's not much comfort to UK greenkeepers waking up to find their greens and tees torn to shreds as an indirect consequence of chafer grub or leatherjacket infestation.

### Chafer grubs and leatherjackets

Direct damage to sports turf by these two insect pests is significant and serious in its own right but the real problems arise as collateral damage from the activities of much

bigger beasts of the feathered and furry kind. Birds, especially corvids (mainly rooks, crows and jackdaws but also magpies and jays) will peck at and tear up turf in a frenzied attempt to get at these tasty and nutritious grubs and particularly the creamy white, plump and juicy chafer grubs.

Much bigger beasts, in the form of badgers and foxes, are also major culprits in this connection and the bigger the beast the greater the damage to turf.

Indeed the foraging activities of badgers or foxes in securing an evening meal of chafer grubs or leatherjackets can easily put greens and tees completely out of play for long periods of time and require considerable work and many thousands of pounds to repair and re-lay torn up turf.

Unlike in North America there are not many dedicated insect pests of turf in the UK – chafer grubs and leatherjackets are the main ones, although frit fly can go up a gear to become an economic pest.

Until recently these were the only invertebrates (animals without backbones) recognised and registered as pests of turf in the



**ABOVE RIGHT:** Leatherjacket the larva stage of the crane fly (daddy long legs) and the second most important insect pest (after the chafer grub) on turf in the UK.  
**INSET ABOVE:** Plump and juicy chafer grubs are prime targets for animal predators which tear up turf to get at them.  
*Photograph courtesy Syngenta*

UK. However, recent years have seen some frenzied interest in even smaller animal pests with root feeding nematodes (microscopic roundworms) very much under the microscope.

### Microscopic roundworms (nematodes)

Root feeding nematodes are an enormous problem, throughout the economic plant world, with particular species causing huge losses in agricultural crops from potatoes





to tobacco. Their smallness of size has always hampered identification and recognition as pests and is clearly one reason why they have only recently come to the fore in professional turf.

Nematodes as turf pests are a bit of a conundrum for two reasons. Firstly, the leaf symptoms of nematode presence on the roots of turf grasses is rather diffuse and, in many cases, not a lot different from the symptoms caused by microbial pathogens and in some instances plant nutrient deficiencies.

For this reason, and because early scientists could not see the actual animal pest eating away at the plant (nematodes are too small to see with the naked eye and are underground on the roots), they would assume a microbial pathogen was responsible. For this reason nematode invasions of plant roots were traditionally called infections but, as animal pests of turf grass, nematodes are an infestation of the fibrous root system.

Secondly, not all species of roundworms are 'nasty nematodes'. Many are exceptionally useful like the species currently used in commercial biological control products to control chafer grubs and leatherjackets.

### Surface feeding earthworms

The other invertebrate pest not yet mentioned, and like the nematode a worm though much bigger and technically called an annelid (ringed worm), is the earthworm.

The other characteristic that earthworms have in common with nematodes is that not all are damaging as far as the golf course is concerned. Indeed, the vast majority are not only useful but downright essential for improving and maintaining the physical structure and fertility of the soil.

As far as the greenkeeper is concerned it is only the surface feeding species of earthworms which are a problem and specifically when they inhabit the soil underneath the pristine playing surface of golf greens and to a lesser extent tees. Unlike most earthworm species, which deposit their casts in the burrow, these surface feeding species deposit their casts on top of the turf when they come up to feed on dead and decaying plant matter in thatch, or debris such as grass clippings and fallen leaves on top of the turf.

Worm casts on sports turf are not only unsightly but clearly interfere with the run of play across the surface of the golf green. There is also a safety angle because contents of the cast have passed through the worm's gut picking up copious quantities of slimy secretions along the way. This not only makes worm casts difficult to remove without smearing the close-mown turf but may also create hazards for players who may slip on the slimy surface. What's more worm casts act as ideal germination sites for weed seeds coming onto the green. Moreover, the weed seed may already be there having passed intact through the



**ABOVE LEFT:** Red flag for danger' – a West Sussex golf green 'pecked to pieces' by corvids (rooks and crows) foraging for chafer grubs (Photograph courtesy Chris Humphrey)

**INSET ABOVE:** Worm casts make ideal germination sites for weed seeds and seedlings like the dock seedling shown here

**ABOVE RIGHT:** Worm casts on turf are unsightly and interfere with the 'run of play'; Surface worm casts are slimy, from having passed through the worm's gut, and therefore smear freely and easily across the turf to become even more unsightly and cause slippage

worm's gut and ready to germinate in the nutrient rich worm cast.

### Bigger beasts

And where there are worms there are moles. Anyone who has seen the movie *Jaws* will surely remember the classic comment made by actor Richard Dreyfuss who played the "shark expert" in describing how the shark is simply an "eating machine". "All they do is feed and make baby sharks," said Dreyfuss.

In many ways the mole is the terrestrial equivalent of this marine predator because all it does is burrow to find tasty soil animals to eat, almost entirely worms but sometimes slugs and other animals, and of course takes time off to make more moles.

Like the badger or the fox on the hunt for grubs this mammal, though much smaller and virtually blind, can do just as much damage to professional turf through its burrowing and inevitable and accompanying mole hills.

The more fertile the soil the more worms it will support and the bigger its attraction to the mole.

Turf damage by birds is usually collateral to chafer grub and leatherjacket infestations but there are particular birds, in certain situations, which can become pests of turf in their own right. These are wild water fowl such as the Canada goose and the pink footed goose which may see the first signs of new grass growth in March and April as an inviting early spring 'bite' and





**ABOVE:** Collateral damage from wild mammals (badgers and foxes) looking for chafer grubs can put greens and tees out of play for lengthy period of time as happened on this East Anglian golf course (Photograph courtesy Bayer Environmental Science)

subsequently crop the turf even lower than the mower manages to do. At the same time they will inevitably deposit their characteristically loose and slimy faeces across the turf.

Last, but not least, rabbits are also capable of cropping close-mown turf grass to cause significant damage in large numbers and leave something nasty behind, although in this case small, round and hard droppings which can easily be swept from the surface of the green or tee.

That said, most serious damage from rabbits on the golf course is most likely to arise from their burrowing activities and bark gnawing on young newly planted trees. Rabbits are particularly fond of sandy soils in which to excavate their burrows.

### Chemical control

Control of leatherjackets and frit fly was never a big problem once chlorpyrifos hit the market many years ago. Chlorpyrifos is one of the most useful and valuable insecticides on the market. And not only the turf market having been one of the mainstays of pest control

in agriculture, horticulture and forestry, and even public health, for many a year.

Despite its excellent control of leatherjackets it was never recommended for the control of chafer grubs, although not a few people automatically thought it controlled this pest too.

It probably would if it could get down to the chafer grubs but chlorpyrifos does not leach, remaining in the topmost layer and unable to reach chafer grubs lower down.

Several insecticides were traditionally used to control chafer grubs, but they were withdrawn when true extent of their 'poisonous nature' became apparent.

Several years followed with a gaping hole in the turf insecticide market and even bigger holes on greens and tees because greenkeepers had nothing to control chafer grubs.

Respite came with imidacloprid and revolutionising chafer grub control in a short space of time. Imidacloprid is doing the job and excellently too but there is probably room for at least one more insecticide to clobber chafer grubs and deprive the birds and the badgers of their 'free lunch'.

### Biological control

Chemical insecticides are not the only option because there are now biocontrol products based on entomopathogenic nematodes which invade the chafer grub or leatherjacket and introduce a pathogenic bacterium that kills these insect larvae.

However, those wanting a quick and complete kill and at any time of the year may be disappointed by biological control.

Biocontrol agents are, by definition, density dependant pest management factors, rising in number and activity alongside an increasing pest population. As such they work much more slowly than do chemical insecticides and will only reduce pest numbers to below economic levels rather than wiping them out.

In addition, these are living organisms with much more stringent environmental requirements (eg temperature, soil moisture and relative humidity and soil pH) for their activity compared to chemical insecticides.

Timing of control is clearly important with greenkeepers needing to catch chafer grub and leatherjacket infestations as early as possible,



and in this context they can put the activities of predatory animals to good use. Not badgers and foxes because these are nocturnal animals which will tear up your turf to get at the larvae without warning, and under the cover of darkness, but the birds are a different matter.

If you notice that birds, especially corvids but also starlings, are taking an unhealthy interest in your turf, like something out of the iconic Hitchcock movie, *The Birds*, then there is almost certainly something 'for the birds' under your turf and it is time for you to move in, lift a sample of turf to identify the pest and to apply the appropriate insecticide.

**Managing surface worm casts**

While carbendazim remains on the market greenkeepers will have little to worry about in managing surface casting earthworms. However, there are other things which can be done to help the situation and minimise their activity. First and foremost don't encourage surface feeding by leaving debris including grass clippings and fallen leaves on the green.

Always box off clippings and keep the greens and tees well swept especially in autumn when the leaves of deciduous trees fall fast and furiously. Creating an acid reaction in the surface layers of soil using approved soil conditioning products, including those based on sulphur and ferrous (iron) sulphate, will deter surface feeding earthworms. Turf grasses perform best in slightly acid soil conditions but will react negatively if the pH gets too low. It is all a question of balance.

**Mole control in hole**

Dealing with moles is a 'prickly' problem, not least due to inherent difficulty, but also because the remaining methods, though legal, are not too pleasant for moles which are protected species in other European countries.

Traditional use of worms laced with strychnine and used as mole bait was banned five years ago. Remaining methods are strictly for professional mole catchers and pest control operators.

Surprisingly gassing is still allowed but this is strictly for the trained and certificated pest control operator. What's more, the chemicals used are essentially nerve poisons in mode of action and hardly the sort of thing you want wafting around the golf course.



**INSET ABOVE:** Tell-tale signs of wild rabbits on a North London golf course

**BOTTOM RIGHT:** Wild water fowl such as Canada geese (Photograph 9) and pink footed geese (Photograph 10) are surprisingly fond of short damp and wet grass for feed, rest and play

**RIGHT:** Leaves on the green encourage surface feeding earthworms and their casts



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Old timers used all manner of traditional deterrents including moth balls (naphthalene) placed in the mole hole but that is illegal now because naphthalene containing mothballs are banned within the EU. Others would place sprigs of holly down the mole hole attesting to the fact that mole control is a 'prickly problem'.

Perhaps the most innovative old time method was sinking bottles into the turf with their necks protruding marginally above the soil surface. Musical notes thus generated by wind blowing across the open tops of the bottles was claimed to deter the moles but this is clearly a definite 'no-no' from the 'health and safety' point of view.

The Americans claim that playing music down the holes will clear an area of moles.

The only problem is if the moles decide they like the music and stay around to listen.

**For bunnies and birds**

Similar caution goes out for rabbit control with the clutch of claimed options such as gassing, 'blowing up burrows' and shooting strictly for the trained expert, although as for moles these are not the sort of activities suitable for intensively

used golf courses many of which are also public rights of way. All newly planted trees should be fitted with rabbit proof tree guards or tree shelters.

As for wild fowl tucking in to an early spring 'bite' on your greens, most if not all of these are protected species. All you can do is wave your arms and make loud noises and hope they will not come back. Seriously though if this becomes a persistent problem there are a number of innovative bird scaring devices mainly targeted at the agricultural market but equally ideal for the amenity sector.





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# Course disease alert!

Dr Kate Entwistle offers details of two new diseases which have been identified on UK golf courses

## Rapid Blight

**Two newly emerging turf diseases have recently been confirmed in samples received from golf courses in the UK and Ireland and it is suspected that they are more prevalent in areas of fine turf than are currently recorded.**

During 2012, The Turf Disease Centre will be collating information on turf samples received for analysis that are positively identified with either of these two diseases and a summary will be published later this year to show their recorded regional occurrence.

The most important step in effective turf disease management is the identification of the cause and with the apparent emergence of these new disease problems, this fact has never been more important.

### **Rapid Blight - A non-fungal disease**

In 2004, turf samples were received from a golf course in the UK where the greens were showing a progressive decline in turf quality. Patches of affected turf up to 30cm across were becoming red/brown in colour, watersoaked in appearance and thinning out due to the

loss of *Poa annua* and *Agrostis* spp from the sward.

Analysis of the turf identified the presence of a non-fungal organism called *Labyrinthula* within the plant tissues and a disease known as Rapid Blight was recorded for the first time in Europe. Subsequent collaboration between The Turf Disease Centre and Dr Mary Olsen at the University of Arizona, confirmed the identity of the organism as *L. terrestris*, a new species of *Labyrinthulid* that Mary had initially identified in 2002 as the cause of this increasingly important turfgrass disease.

Over the past three years, The Turf Disease Centre has received a small number of turf samples affected by Rapid Blight that have originated from Ireland, Spain and Portugal but it is believed that the incidence of this disease is much higher than has currently been recorded.

In Spain, the disease showed dramatic development of symptoms on creeping bentgrass greens (with patches up to 2m diameter) and extensive discolouration and turf loss on fairways (Fig. 1 & 2). The severity of the problem is correlated with not only the grass type



MAIN ABOVE: Rapid Blight on creeping bentgrass in Spain

INSET ABOVE: Fig. 2. Fairway damage caused by Rapid Blight in Spain

that is present but also ambient temperature and the level of salinity in the rootzone or applied irrigation. *Poa* species are very heavily affected by this pathogen, as too are *Lolium perenne* and *Agrostis* spp. Warm-season turfgrasses can harbour *Labyrinthula* within the plant tissues but they don't show evidence of any disease.

If these grasses are over-sown with cool-season turf, the young seedlings inevitably become infected and disease symptoms will develop.