

CHAFER GRUB

THE PRE-EMINENT

INSECT PEST OF

UK TURF

By Dr Terry Mabbett

Turf provides an ideal feeding and breeding ground for invertebrate animals including insects, arachnids, crustaceans and nematodes. As a perennial ecosystem turf grass generally offers well-fed and managed foliage and a dynamic thatch layer overlaying a relatively deep and dense fibrous root system.

Pests have access to year round food and harbourage, essentially undisturbed for decades if not centuries. That said turf in the United Kingdom gets off relatively lightly from invertebrate animal pest infestation and damage compared with North America.

Turf grass root zones offer ideal long term habitats for invertebrate animals and much more so than the annual 'grasses' (cereals) cultivated for grain. Many different invertebrate animals inhabit turf root zones and thatch without causing damage.

Around half a dozen are recorded as pests in the UK and just two insects (chafer grubs and leatherjackets) assume major pest status.

Chafer grubs and leatherjackets (larva stage of the crane fly) damage grass roots and attract wild mammal and avian predators that cause even more damage by tearing at the turf to get at the larvae.

Invertebrate pests are without backbones but chafer grubs (and leatherjackets) have the capacity to 'break the back' of fine professional turf by rendering green and tee surfaces unplayable.

Chafer grubs are sporadic and less widespread than leatherjackets but generally result in more economic damage both directly and as collateral turf damage from wild mammalian and avian predators.

Life cycle

Juvenile stages of insect pests generally cause most damage even though the adult is invariably more mobile. Chafer grub which is the larva stage of chafer beetles (Coleoptera) is no exception. Adult chafer beetles feed on a wide variety of plants causing little damage but the larvae cause economic damage to turf grass roots. Species most frequently found in turf are the garden chafer (*Phyllopertha horticola*) and Welsh chafer (*Hoplia philanthus*), the latter especially in sandy soils.

Adult garden chafer beetles have a metallic green head and thorax with light brown wing cases. Welsh chafer beetles are similar in size (9mm length) with a black head and thorax and reddish brown wing cases. The larva (chafer grub) has a white fleshy segmented body in a curved 'letter C' shape with three pairs of legs on anterior (front) segments. The head is distinctively light brown. A full grown chafer grub is about the same length as the adult beetle but if straightened out would be twice as long.

There is little chance of confusing chafer grubs with legless leatherjackets but they can be mistaken for vine weevil larvae 'curse' of the container plant industry. Vine weevil larvae are smaller than chafer grubs and like leatherjackets are without legs.

Adult chafer beetles emerge from the pupa stage in late May and June and dig their way up to the soil surface. Numbers increase rapidly as dusk descends on warm early summer evenings when newly-emerged adults mate before burrowing back into the soil to lay eggs.

Chafer grubs hatch within two to three weeks and start to feed straightaway. Continuous and increasingly intense root feeding will now proceed into October on unprotected turf. Grass roots cut and damaged by chafer grub feeding cannot

maintain water and nutrient supplies leading to undernourished turf that yellows and eventually dries dry out. Accumulating damage destroys grass root anchorage allowing turf to be raised and rolled back easily to expose the chafer grubs. Damage is slight at first but builds up quickly during late summer and early autumn (late August/September), when grubs are almost full-grown with voracious appetites. Chafer grubs are full grown and mature by mid October when they burrow deeper into the soil to over-winter as hibernating larvae before pupating in spring (April).

Direct and collateral damage

Chafer grub infestations develop underground and unnoticed until turf starts to show symptoms of damage in early autumn after summer-long root feeding. Turf damage is now severe and the large succulent and protein rich grubs will have attracted the attention of predators. First on the scene will be 'grubbing' birds especially corvids (rooks, crows, magpies and jays) foraging during the day, and later wild mammals such as badgers and foxes ripping up already loosened turf at night.

This is one instance when biological control of insect pests is undesirable and unwelcome. Collateral damage caused by birds and mammals is considerable, running into thousands of pounds for green and tee repair and as lost fees when large parts of the course are put out of action. Chafer grub infestation is heaviest on greens and tees because established sandy-soil bases offer ideal sites for chafer oviposition by adult chafer beetles. Similarly soft professional turf on greens and tees is easy for birds and animals to tear up.

Rural and urban golf courses are equally affected. Fox population inside the M25 is estimated at 15,000 and the London Evening Standard reported how some 60 foxes dug up greens on a North London golf course causing £30,000 of



Chafer grub displaying the classic curved C-shape



Chafer grubs cut grass roots allowing dried out turf to be rolled back to reveal the pests



Extensive damage to turf by badgers and foxes foraging for chafer grubs

Pictures on this page courtesy Bayer Environmental Science

Raising the Game for Disease Control



damage in the process. Chafer grubs feed on a variety of plants and turf infestations are usually more prevalent near to woodland.

The offenders are highly mobile mammals and birds invariably arriving from neighbouring land and property. Arrival of predatory birds can actually prove useful by alerting greenkeepers to the developing problem. When birds begin to show undue and unhealthy interest in turf it is generally a sure sign that chafer grubs (and/or leatherjackets) are under the grass and insecticide treatment is urgently required.

Chemical control

Only recently has an entirely suitable insecticide treatment become available for control of chafer grubs in turf. Some of the very earliest chemicals used against chafer grubs (and leatherjackets) were acutely toxic and until relatively recently greenkeepers had been forced to use insecticides now seen as damaging to the environment, although they did by and large kill these pests.

Withdrawal of products containing gamma HCH (lindane) in 1999 left a complete void for chafer grub control because contrary to popular belief chlorpyrifos was not recommended for chafer grub control, although it did a perfectly good job against leatherjackets. Reason was simple -

chlorpyrifos resists leaching and stays in the top layer of soil. Under normal circumstances this would be a bonus but the active insecticide is unable to reach the deeper-seated chafer grubs.

Chlorpyrifos is a broad spectrum insecticide used worldwide in agriculture, amenity and public health. It would almost certainly kill chafer grubs if able to reach chafer grubs and make contact after standard spray application.

The void left by withdrawal of gamma HCH in 1999 was soon matched by equally big holes in professional turf.

Greenkeepers were left to face chafer grub infestations and their consequences with no approved recommended insecticides. The situation remained unresolved until 2006 when Bayer Environmental Science introduced Merit Turf a granular formulation containing the insecticide imadocloprid with approval for chafer grub control in turf.

Biological and cultural control

Chafer grubs in turf can be managed by biological control using the entomopathogenic nematode *Heterorhabditis megidis*.

These microscopic roundworms invade chafer grubs infecting the larvae with a fatal bacterial disease. They are watered into the turf when the

soil is already moist and temperature is within the 12-20°C range.

By definition, biological control agents are density dependent factors that 'track' and 'follow' their pest hosts or prey. As such numbers and activity increase with higher pest populations then falling away as the pest population decreases.

As biological systems they require more exacting environmental conditions (e.g. temperature, moisture, pH, soil structure) to grow, move and reproduce for effective pest control.

Biocontrol agents therefore tend to operate within a narrower profile of conditions than do chemical pesticides. They generally need more time to work which greenkeepers may not have. With greens and tees out of action from chafer grubs, and fees and reputations being lost, course managers and club captains will be stalking the course looking for 'trophies' and not the shiny metal kind.

Good golf course management practice will assist turf tolerance and recuperation following chafer grub attack.

Selection of deeper rooting turf grass species and appropriate management practices that encourage rapid and healthy root growth and development (e.g. well-timed and balanced applications of phosphate fertiliser) are recommended.



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WHY OVERSEEDING DRAMATICALLY IMPROVES COURSE CONDITIONS

Managing turf areas will always be challenging and overseeding plays a key role in improving turfgrass conditions. Stephen Denton reports...

Overseeding is a subject which is often discussed but not always understood. So why do we need to overseed? The main reasons are to maintain the balance of cultivars, to introduce new cultivars, to ensure grass can cope with heavy wear and to maintain consistency throughout the course.

Conditions can deteriorate if you do not overseed, which seriously affects playing conditions and the presentation of the course.

So how does grass grow? Following a natural cycle, during June, July and August the growth pattern of the grass plants slows as the grasses attempt to produce flowers and seed.

In an amenity situation these botanical changes restrict both the crown and root establishment of the individual grass plants. This can cause stress leading to a reduction in plant cells, which then significantly impacts on establishment of the turf surface the following spring. Higher stress levels within the grass plants seriously affect the important autumn growth.

During a wet summer it is likely a high percentage of the leaf density will consist of weak lush leaves and shoots susceptible to stress, winter wear and weed invasion.

Weather patterns during any year – whether

wet as during 2007 and 2008 or hot and dry as in 2006 - amplify the problems that are likely to occur going into this vital autumn and winter period.

Seed sowing

In theory, grass seed can be sown at anytime of year, even during the winter. However, the potential for failure is higher during this period as conditions are often less favourable.

As a guide as long as light, air, water and appropriate temperatures are available, turfgrass seed will germinate.

One of the benefits of autumn overseeding is it increases the percentage of healthy desirable species within the sward. For best results seed should be sown on two or three occasions at half rates.

Considerable benefits in adopting this programme include improved wear, density, disease resistance and a more rapid establishment during the following spring when the next growth pattern commences.

New cultivars have been bred and varieties are continually being improved to meet the increasing pressures placed on the sward by climatic changes and increased usage of the golf course.

Management regimes

Different grass species have varying demands in terms of maintenance inputs. Those demanding intensive management, notably annual meadow grass (*Poa annua*), fail in terms of producing a truly sustainable sward.

Annual meadow grass can be categorised as a ruderal plant, one that will inhabit environments where low stress, high disturbance and reduced competition exists. It has adapted through time to be able to germinate, grow and produce seed very quickly thus colonising weaker areas. This rapid production continually adds new material to the seed bank within the soil. Copying this successful method of establishment by regular light over sowing of other desirable grasses will create competition by increasing density and uniformity. This then limits the availability of resources for the undesirable species.

Trials carried out on one-metre plots over a two-year period which received six separate overseeding operations exhibited a 12% increase in density but more importantly a reduction by 10 to 15% was noted in annual meadow grass ingress. By adding new material to the sward system on a regular basis, a balance of developing vigorous and mature plants can be achieved helping to



Striking seed on West Cornish golf course

At the picturesque West Cornwall Golf Club where Keith Kemp is Head Greenkeeper the sea forms a dramatic backdrop to this testing 18-hole links course. Developed out of 100 acres of dune land and established in 1889 this is thought to be one of the oldest clubs in Cornwall.

On taking over his current role Keith's principal aims were to bring back fescues to dominate the greens and address green speeds.

David Rhodes was taken on as consultant agronomist to help provide advice on the best way forward and Keith says: "He certainly got the ball rolling to improve the management of the greens. This looked at a more sustainable approach and encouraged a return to the links-style course in line with the original design.

"Regular overseeding was recommended as part of this programme and this has already paid significant dividends. Currently we are getting through one of the coldest winters I can remember and the greens have been holding out well."

Initially overseeding took place using Mascot R101 from Rigby Taylor and now R117 is applied as it contains 25 per cent chewings fescues Calliope and Greensleeves together with slender creeping red fescues Helena and Cezanne.

Aeration has also increased dramatically together with top dressing. The club has

purchased an Aircore 800 pedestrian aerator and Keith and his team Sorrel roll at least once a week to keep the surface open.

Overseeding programme

Overseeding takes place three times a year, firstly in spring and summer at a rate of 12gms/sqmetre with further overseeding in the autumn at a rate of 20gms/sqmetre.

"We need to treat each green differently to get them up to the same level," says Keith. "Some greens are very high in fescue content others low due to different micro-climates."

Overlooking St Ives Bay one part of the course is 6.59metres above sea level with the 16th green the highest point at 64metres

Top dressing has increased to fortnightly throughout the growing season using a 90/10 Roffeys mix. In the first year 130 tonnes of top dressing was used and applied by a Dakota spinner dresser which allows fine applications.

Keith says: "As a result we have been able to raise the height of cut and still produce a good putting surface. This has helped to encourage the fescues."

Brushing takes place on a regular basis as this stands the grass up before cutting it to reduce any lateral growth.

Seaweed products such as Maxicrop have also been showing good results.

Keith says: "Now there is greater uniformity across the whole course and vital improvements have been made to playing conditions."

create the desired surface.

Management practices undertaken also directly influence the grass species composition, especially on putting surfaces.

In northern Europe, the fescue grasses (*Festuca* species) and browntop bents (*Agrostis tenuis* and *A. capillaris*) indigenous to links and heathland produce the best turf for golf from playing, economic and environmental viewpoints. These species benefit from minimal intervention.

Browntop bent has a wider range in terms of habitat than the fine-leaved fescues. It tolerates wetter and more fertile environments and is equally at home on dry and infertile terrain. The fact that it is naturally found in the former explains why it is often seen in greens along with annual meadow grass. Its ability to thrive in dry and infertile soils provides the key to its competitive edge over this relatively unsustainable species.

Successful management of fescues and browntop bents is only achievable if certain conditions that favour these grasses in their natural environment are replicated on the golf course. Notably they require low fertiliser and water inputs, but maintenance needs to compensate for the wear caused by golf and greenkeeping traffic.

August and September provide the most suitable conditions for overseeding browntop bent.

However experience has shown that halving the seeding rate and making regular overseeding operations dramatically increases the percentage of seed that establishes.

Spring fescue overseeding should take place when a temperature of six to eight degrees centigrade or above is achieved and air temperatures reach similar values. Seed should be sown with a disc or dimple-type machine to a depth of no more than 7mm. Alternatively micro tine aeration or scarification to create a seedbed followed by light top dressing is another method of application.

Height of cut should be maintained at no less than 5mm to aid establishment of the new seedling plants. Initially this will affect the pace of the surface but this can be improved by regular very light applications of a suitable top dressing material. Once the new plants reach the two true leaf stage (approximately three to four weeks in ideal conditions) mowing heights can then be reduced.

It is important to be aware however, that reducing mowing heights is not the best way to create pace, as increased stress is placed upon the sward. Regular light V-mowing to stimulate vertical growth and regular top dressing is by far the most beneficial approach. The use of potassium based amino acid products has been shown to

increase the turgidity of the plant cell structure creating a more upright leaf. This creates lower resistance to the golf ball running across the leaf tip, whereas a flat leaf blade will impart greater resistance on the ball, slowing it's progress.

There are various methods of overseeding with browntop bent. The most effective is to aerate using 7mm micro solid or hollow tines in a very close-set pattern, applying a light top dressing and matting to partially fill the holes. The seed should then be applied either through a drop spreader or dimple seeder followed by top dressing again and drag matting into the surface. Light firming of the surface helps to achieve good seed to soil contact. This method ensures that the bent seed is in contact with the soil rather than any organic thatchy material. The application of seaweed type products will also have beneficial effects.

Investing in your seed bank is probably the best investment a golf club can make to improve course conditions, certainly paying a better dividend than any other "bank" currently available.

About the Author

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SUSTAINABILITY, IT'S NOTHING NEW!

Peter McVicar, Course Manager of Hesketh Golf Club, takes a step back into golfing history to look at sustainable golf.

As in every walk of life, or chosen profession, we as greenkeepers are told about “new” operations or techniques to help attain the “sacred turf” we desire.

Currently the buzzword flying around is sustainable, I'm sure we've all heard it and have our own interpretation on what it means. What does a sustainable golf course really mean? Well the R&A say:

“A sustainable golf course optimises the playing quality of the golf course in harmony with the conservation of its natural environment under economically sound and socially responsible management”.

Sustainable development and management is fundamental to the future success of golf and to achieving The R&A's goal of having more people playing more golf on more facilities in more countries. Sustainability can only be achieved through the implementation of best practice and is only as flexible as the single limiting factor in its definition which applies to any specific site which, more often than not, will be environmental or economic considerations.

So, in my words, a course that is environmentally and economically friendly.

But surely we as greenkeepers should have been doing this since greenkeeping times began. The first course manager I can find reference to is

Alexander Munroe who tended the Links at Royal Aberdeen in 1820, surely he was thinking about these issues as he was looking after the course, incidentally he was paid £4 for his duties and two years later, this was reduced to £2.

But let's look more in depth at these best practice guidelines...

1. Mowing.

Select the right machine for the job and ensure that all cutting units are sharp to reduce potential tearing and bruising of the grass leaf, which can result in discoloration, stress and disease.

Avoid over-close mowing of the grass species being managed as this will result in stress and thinning of the sward.

Mow frequently enough to retain desirable surface characteristics, though avoid unnecessarily frequent mowing which may lead to mechanical wear of the grass.

Box off clippings to areas where minimising thatch accumulation is essential to the production of playing quality.

Vary the direction of mowing to reduce wear patterns and the development of grain.

Avoid over-close mowing of the grass species being managed as this will result in stress and thinning of the sward. This is often one of the main reasons why greens established with specially

selected species revert to annual meadow-grass (*Poa annua*).

So basically sharp blades, change direction and collect clippings.

2. Aeration.

Select the most appropriate tool for the job, e.g. thatch removal is best achieved with hollow cores; irrigation management can be achieved with narrow solid tines or water injection equipment.

Vary the type of aeration and the depth of penetration through the annual programme to work on all potential problems.

There is documented evidence that the course managers as far back as the late 1800's were using graips (large fork type implements) to carry out aeration practices on the course, is this not similar to verti-draining?

3. Top-dressing.

Usually a high sand content, bulk material. Select material compatible with, but not of a finer texture to, the growing medium.

Apply at a frequency and rate aimed to match the rate of growth and thatch accumulation.

Avoid applications which exceed the rate of growth and thatch accumulation as this will result in stressed and thin turf.

Avoid top dressing outside the growing season



Triple gang circa 1923: Slow work for man and beast (Courtesy Practical Greenkeeping by Jim Arthur)



Old Tom Morris, Peter McVicar's hero (Courtesy Practical Greenkeeping by Jim Arthur)

as this may smother turf or promote unseasonal lushness, both of which may result in disease.

Avoid top dressing when turf is under any form of stress as the abrasive nature of the dressing means working it into the turf will cause damage.

These are just three examples of the best practice guidelines, but don't you think they are very similar to what traditional greenkeepers have always been doing, others guidelines look at grasses we desire and water and fertiliser application, fescue being the best grass, apply very little fertiliser and hardly ever water, but if you have to, hand water - the best courses around (in my opinion) are the ones that water to keep the grass alive, not to keep it green.

One of my favourite old stories, is the one about the greenkeeper (back in the day) who has a rabbit problem, he goes out one morning and sees a urine burn on the green, he studies this and soon sees a lush growth around the outside, then the poa starts to get hold, this gives him the great lesson of grass and fertiliser and what it can do.

The best tool a greenkeeper has is not the computer in the office or even the verti-drain in the shed, but the eyes he has in his head, all too often people will buy something or carryout tasks without consulting the turf, just by looking and talking to the turf all the answers are there waiting.

My humble opinion on the sustainable golf course is that it's nothing more than, as another of my heroes would say "practical greenkeeping", everything being said is a repeat of what the great Jim Arthur told us years ago, and nothing more.



At Augusta, a platoon of greenkeepers cut fairways with triplex mowers, traveling in echelon

Don't get me wrong, I think the R&A are doing a great job in promoting "common sense greenkeeping", but I feel sometimes it has to be remembered that quality greenkeepers have always done this and will continue doing so.

So when somebody else asks me if I'm trying this new sustainable approach, I will smile and think of Auld Tom wandering around Prestwick before the first British Open in 1860, and reply,

"No, I'm still doing things the old way..."

"Old Tom Morris had two rules for greenkeeping, the first was Sand top-dressing, he was often heard shouting "Mair saund, Honeyman" - this was a call to his assistant to top-dress everything. He believed it was required to "maintain the character of the grass". The other was "Nae golf on Sunday". He believed the courses needed a rest even if the golfers didn't."

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A QUICK GUIDE TO...

Landscaping

As the growing season approaches, Iain Mulady, Gardener at The London Golf Club, offers ten tips to bring your clubhouse gardens up to par.



1. Into the nights

It's easy to forget the evenings when you're working greenkeeping hours, but it's a time of day when visitors will see the gardens in more detail as they relax with a drink on the terrace. Maximum advantage should be taken of the long, warm summer evenings – lighting, especially uplighters on decorative stemmed trees, look fantastic year round and scented plants, both can extend the hours of interest and encourage customers to linger.

2. Don't forget sculpture

The use of sculpture, be it formal and precise or stylised and naturalistic, can provide extra interest and an effective contrast and foil to planting, lifting it beyond just corporate landscaping. With some artists it can be varied year on year and be displayed on a sale or return basis and it's virtually maintenance free!

3. Low maintenance gardening is a false idol

No such thing exists and any attempt can lead to massive future problems as tough, invasive plants like ivy grow into one another and the persistent weeds force their way through. Careful, knowledgeable plant selection and design can allow for easy maintenance of manageable species in a sustainable manner.

4. Detail

The grander strokes of planting can provide form, colour and structure but it's the little things that jump out at visitors. The garden doesn't have to be painstakingly intricate, but a few carefully positioned focal points and surprises can provide visual interest and impress even casual passers by.

5. Don't get muddled

Lots of different plants jumbled together can often seem too busy to the eye. It must be remembered that it's still a golf club primarily and bold swathes of colour and consistency provide a better experience to passers-by than an overly detailed and fussy cottage-garden. The trick is getting the mix right – bright highlights shine at their best against consistent and strongly formed backdrops.

6. Done once, done properly

In a high profile situation like golf club surroundings it can be very challenging getting the work done without causing upset to the non-stop flow of golfers. It can be tempting to try and do a quick revamp of large areas without any disruption, but taking shortcuts will only result in more disruption later – the hard and messy bit will still have to be done eventually to put things right and until then substandard work is out on show for months or potentially years. Get it over with – the results will last for years so it's always worth it.

7. Winter interest

While the playing of golf slows over the winter months the gardens provide an extra opportunity to keep business flowing, even if the course is closed. Form, scent and colour can ensure the clubhouse remains an attractive place to relax, eat, drink and socialise by focusing on garden areas visible from windows and conservatories.

8. Don't spare the rod

Pesticides have a bad reputation in the increasingly organic world of the home gardener, but they have an incredibly useful role to play. Residual herbicides can save uncountable man-hours of weeding and correct application can allow for drastic weed control without disturbing the surrounding gardens.

Many modern insecticides can be very safe to humans and the environment when properly used. Be more than prompt with fungicides – by the time the problem looks serious it is probably too late.

9. Encourage interest to realise potential

A vast proportion of members will have gardens of their own and plenty of enthusiasm about gardening. Attracting and holding their interest is a potential marketing coup with a knowledgeable gardener on hand to answer questions and botanical labelling of plants to provide added information.

10. Planning

Timing disruptive tasks before golfers arrive, to planning schemes of new planting and design, it is critical that you work in an organised fashion and with an eye to the future.

The course will still be there in 10 years time, and with good planning the gardens should only have matured and improved along the way.



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STRIKE A POSE!

BIGGA's Photographic Competition, supported by Syngenta, is back

Calling all budding photographers!
Are you proud of your course? Do you catch yourself admiring it in a certain light?

The BIGGA Photographic Competition, supported by Syngenta and back for its fourth year, creates an opportunity for greenkeepers to display their artistic flair, while also earning some publicity for their club.

The winner will receive a full course profile in Greenkeeper International and a special prize, while the 12 best pictures will be selected for the 2010 BIGGA Calendar.

Photographs will be accepted in three forms. Prints, transparencies, or digitally. Digital pictures must be at 300 dpi (dots per inch) on the camera's highest quality setting, and capable of being scaled up to A3 print size (42cm wide x 29.7cm high). Please note, cropping may occur if photos are to appear in the magazine or calendar. Also please ensure digital photos do not show the time/date display!

Anyone wishing to enter should email them to: tom@bigga.co.uk, entering 'BIGGA PHOTO COMP' as the email subject header. Alternatively post to: Tom Campbell, BIGGA HOUSE, Aldwark Manor, Alne, York, YO61 1UF by July 31, 2009.

Only BIGGA members are eligible to enter. Please note Syngenta will have access to the winning pictures and will credit them when and if used.

Winning photographs from last year's competition are shown. At the top of the page is the winner, Marriott Meon Valley GC – Looking West by Dean McMenemy.

Above right is Hankley Common GC – Dewying Green by Gareth Roberts, which came second. Below right is Papillion, Montgomerie (Turkey), by Liam Bergin, which came third.

So come on...strike a pose!

