

Thatch is the layer of intermingled and entwined dead and dying grass stems, leaves and roots which accumulates naturally in between the actively growing turf grass plants and the soil beneath. Thatch is a perfectly natural, normal and important part of a sports turf sward but like all things in life and nature it's all a question of balance.

An appropriately thin layer of thatch creates a safe cushiony surface for sports or playgrounds, while protecting both turf and soil from traffic that can damage grass stems and leaves and compact the soil. Moreover it can insulate turf

from rapid changes in soil temperature and moisture to protect against extremes and deliver more uniform growth. However, once thatch exceeds the optimum in depth and density all sorts of downsides will come into play and cause serious long term problems.

Effect of thatch on turf quality and resilience

Thatch has a marked effect on the quality of sports turf. A too thick thatch layer restricts air movement in the sward, and ability of water, nutrients and other applied materials to reach the grass root zone. Now unable to access oxygen

and water and nutrients turf grass plants will readily root in the thatch itself to obtain these essential things for growth. Turf grass with roots restricted to the thatch layer becomes very susceptible and prone to drought stress and once it has dried out becomes very difficult to re-wet.

Even when the thatch stays moist other equally serious problems may arise. This dead layer of turf grass (and weed) material, is a natural reservoir for usually dormant fungi but when provided with the right conditions of temperature and humidity will 'step up to the plate' and become aggressive disease causing pathogens.





Conditions inside thick moist thatch are ideal for the disease-causing activity of plant pathogens. If the temperature is right and humidity is high with grass plants in a weakened and stressed state, then this combination of conditions is ideal for fast fungal growth and infection of the grass plant to cause disease.

Microdochium nivale (Fusarium patch) and ***Colletotrichum graminicola (Anthracnose)*** are permanent features of the thatch layer, although they usually 'tick over' as saprophytes (fungi that live and feed on dead and decaying plant matter) or as weak parasites.

However, when presented with the right conditions they will suddenly become aggressive pathogens infecting grass leaves and spreading quickly to cause Fusarium patch and Anthracnose diseases, respectively.

The overall consequences of excess thatch is an unthrifty and unhealthy grass sward failing to respond to otherwise good turf management practice and vulnerable to long term damage from inclement weather (drought, surface water and frost), as well as infection by disease-causing fungal pathogens.

How thatch forms and accumulates

Failure of turf management practices are the major cause of excess accumulation of thatch. Adopting practices that reduce populations of decomposing organisms and, by the same token, selecting those that do is a recipe for excessive thatch. Key decomposers in the soil under turf are invertebrates like earthworms and microorganisms including both friendly fungi and bacteria.

Ideally rates of thatch formation and destruction are comparable and only when the former becomes faster than the latter do problems set in. Research shows how both earthworm and microorganism activities play a vital role in preventing excess thatch accumulation. Good aeration, a soil pH around 6.5 (very slightly acid) and adequate moisture favour the build-up and activity of these beneficial soil animals and microbes.

Problems with thatch are more frequent and acute in compacted soils and those with a clear acidic pH simply because 'decomposers' and especially microorganisms cannot flourish under such conditions. Poorly balanced fertiliser regimes and the indiscriminate use of fungicides and insecticides are two key factors which can impact negatively and heavily on soil animals and microbes with thatch decomposing capacities.

For instance fertiliser applications skewed too heavily towards nitrogen (nitrate and ammonia) promote not only the development of lush green grass growth but also insect pests and disease that take advantage of this abundant food supply. As the new lush growth is devoured by insects and infected by fungi it becomes dead and dying grass debris adding to the layer of thatch.

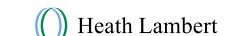
Many turf grass pathogens like ***Microdochium nivale (Fusarium patch)*** and ***Colletotrichum (anthracnose)*** have a quiescent or passive stage where they tick over on thatch as saprophytes and graduating into strong and aggressive parasites (feed on living tissue) when conditions are right. Simply put the thicker the thatch layer then the bigger and better the substrate to support these potential pathogens.



ABOVE TOP: Thatch development in soils close up
INSET ABOVE: Anthracnose in action (Images courtesy of STRI)

Generally speaking failure to remove grass clippings during mowing will encourage the build-up of thatch especially if the clippings are long. Leaving very short clippings on the turf is less of a problem, the argument being that any addition to the thatch layer by what is an ultra-fine biomass with a large surface area is essentially neutralised and compensated for by the promotion of thatch decomposing bacteria. They feed on the clippings to produce soluble nutrients which is a valuable natural resource fed back into the turf. Naturally fed turf is healthy and resilient turf and clearly requires less synthetic fertiliser and fewer applications of fungicide and insecticide.

Species and varieties of grass traditionally used in turf differ markedly in their capacity for thatch production. As a general rule of thumb, perennial creeping grass species spreading by rhizomes (underground stems) and stolons (stems spreading over the soil surface) are high thatch forming species. Smooth stalked meadow grass (*Poa pratensis*) and creeping red fescue (*Festuca rubra*) with



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aggressive rhizomes, and creeping bentgrass (*Agrostis stolonifera*) which has stolons are all classic high thatch forming species.

Annual meadow grass (*Poa annua*) (in spite of its common name) is found in turf as biennial or even perennial biotypes spreading by stolons with accordingly high thatch accumulation. Other species such as perennial ryegrass (*Lolium perenne*) with 'bunch type' growth habits accumulate considerably less thatch.

How much is too much

The right depth of thatch is essentially a 'horses for courses' matter related to species and varieties of grass in the sward, soil growing conditions and the exact use to which the turf is being put. Some texts say up to one inch is okay but general consensus appears to be that anything much over one half inch of thatch, and even one quarter inch for turf on some cold and heavy soils, will start to create problems.

Poa pratensis and especially the aggressively growing and spreading varieties are reported to accumulate up to one fifth of an inch of thatch per year. This may not sound a lot, but when using the one half inch limit there is clearly not a lot of leeway to play with.

Proactive measures are clearly the best foundation for trouble free turf in this respect. Careful selection of turf grass species for the growing conditions presented and judicious use of fertilizer, irrigation, aeration and top dressing all help to minimise thatch accumulation.

Action in the form of de-thatching using dedicated machinery, such as a scarifier or hollow tiner, is something that will invariably be required sooner or later. General recommendations surrounding de-thatching are not to de-thatch when the turf is wet and not trying to remove all in one go.

Ideal time for de-thatching is spring or late summer/autumn and preferably the latter because weeds are more likely to invade a de-thatched area of turf in spring.

INSET LEFT ABOVE: Thatch removal and an overseed process carried out on a West Sussex green, and **MAIN ABOVE:** the same green 10 days after the work was done.

BELOW: The green immediately after thatch removal, overseeding and sweeping.

Pictures courtesy Kensett Sport

De-thatching is commonly part of a wider, integrated turf restoration and re-invigoration programme including top dressing, core aeration and over-seeding.



Playing with thatch levels

Stephen A.G. Prinn MSc, lecturer at Askham Bryan College, York, with an alternative look at thatch

With today's budget constraints that many clubs are imposing it may seem ironic that the members and visitors to the course are also demanding more and more from the greenkeeping staff.

It is the greens where most of this focus would seem to lie and given that each hole allows for two putts per green it may be surprising to note that an allowance of 50% of the game is played on the greens. That's 50% of the game played on a little over 1% of the golf course. So the greens are often what greenkeepers are judged on, rightly or wrongly! This means the effect the green has on the ball, the playability of the surface, is of great importance.

When too much thatch is present the turfgrass environment changes and the effects of this can be seen in the way the ball interacts with the surface. Should levels of thatch become excessive then the disadvantages far exceed the, often stated, advantages of; providing a level of protection and resiliency against traffic stress and ball impact.

Several problems are associated with excessive thatch and need to be understood, the most notable issues as outlined by Beard (1973);

• **Increased disease and insect problems**

ABOVE: Thatch build-up on a putting green. Top dressing has been applied but a lack of mechanical removal has resulted in a layer forming.



• **Localized dry spots**
 • **Soft, often referred to as, 'spongy' surfaces**
 • **Decreased heat, cold and drought tolerances**

Thatch provides some pathogens with an ideal environment for the development of disease. Development of diseases will cause a thinning out or dying of the grass plants which in turn leads to uneven ball roll.

Localized dry spots occur when thatch dries out and becomes hydrophobic, preventing water, irrigation or rainfall, from reaching the soil surface, lack of soil water moisture will result in poor root growth and possibly the eventual dying of the turfgrass.

Soft surfaces can have several detrimental effects on the quality of the greens sward. The potential for scalping increases leaving uneven mowing heights across the greens and damage to the grass plant. Foot-printing may also occur, affecting the ball, which does not hold the line of a putt.

If a golf club has small greens, coupled with limited space for walk on and walk off areas perhaps due to surrounding bunker placements or the proximity of the next tee, or have limited hole placements within the green and this green has

high thatch levels, then those areas which receive the greatest amount of wear will compact the thatch in these areas.

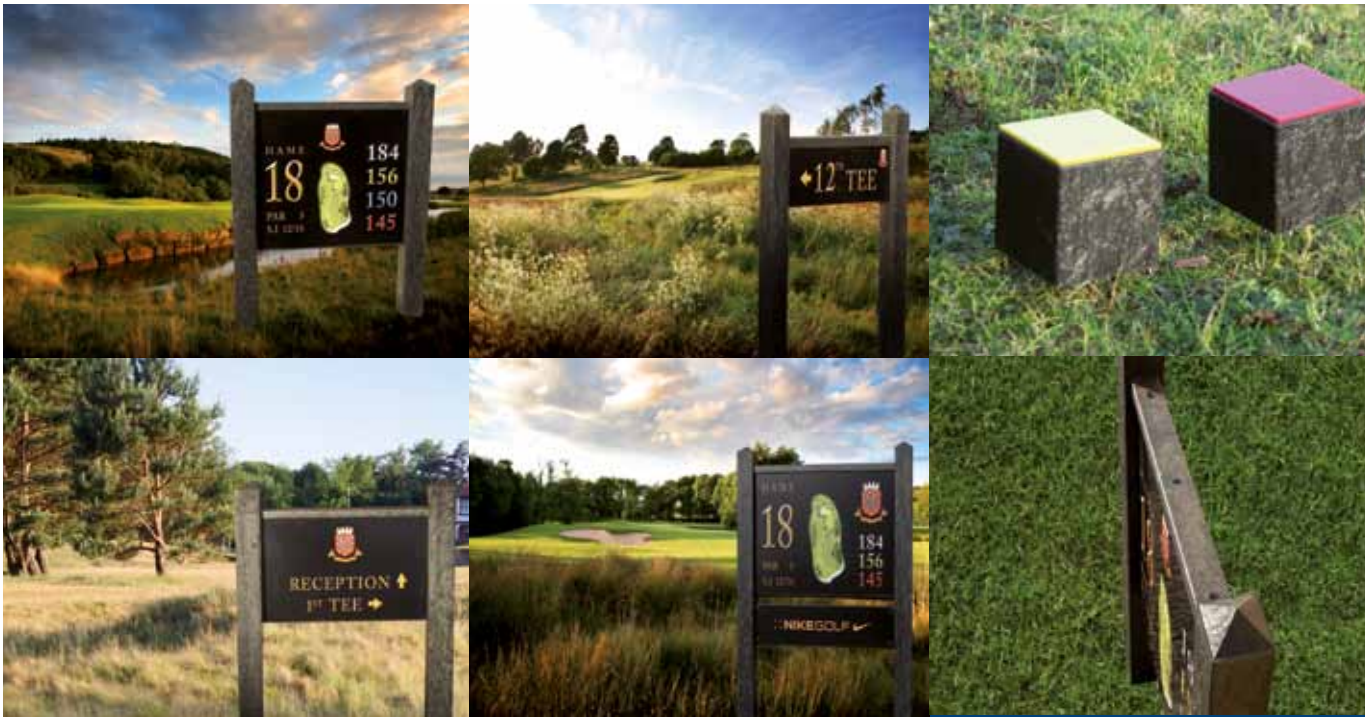
This will increase the ball roll distance in these zones, leading to a putting surface which has variability across the surface for ball roll. There will, therefore, be a variation in ball roll distance across the same green. Even without small greens high thatch levels may lead poor ball roll due to the softness of the surface.

It should also be noted that when greenkeepers attempt to combat the slowness of the thatch by double cutting; Nikolai (2005), found that scalping was much more prevalent on the second pass, resulting in a decline in the turfgrass quality and poorer ball roll.

While an equal increase in ball roll distance could be obtained from rolling rather than double cutting and that may be considered an option, studies by Nikolai (2005), have also shown that the effects of an increase in ball roll distance on a heavily thatched surface only last around 24 hours whilst compared to a green which is relatively thatch free where the effects of rolling may last up to 48 hours.

High thatch levels will also elevate the crown and roots of the grass plant above the soil surface,

Steve Prinn MSc has been lecturing at Askham Bryan College since 1995, starting under Nic Bisset, he is now the Senior Sports Turf Lecturer and manages the L3 Advanced Apprenticeship programme. Steve started out as an apprentice greenkeeper at Close House, in Newcastle, before heading to Mysercough College and an intern programme in the USA. Subsequently, Steve became involved in golf course design and construction, spending many years working with Howard Swan and building courses all over Europe. Steve is currently involved in building three new holes at the college, which utilises the only solar-powered irrigation system in Europe.



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this exposes the key parts of the grass plant to extremes of weather that may subsequently weaken or kill off the plant.

Higher thatch levels therefore can be seen to lead to poorer playing surfaces, either directly through the surface becoming soft, or indirectly through the side effects of a weaker, or perhaps more stressed grass plant which is less able to deal with environmental factors and this subsequently causes a decline in grass cover.

Decline in grass cover may be addressed with over-seeding, but, seedlings that develop in thatch are more susceptible to injury from weather conditions, traffic and other stresses than seedlings which develop in soil (Turgeon 2007). Producing a weak sward in an already weak sward!

Therefore, it is vital to realise that there is an inverse relationship between thatch accumulation and putting green performance.

Thatch can be kept at bay with good maintenance regimes, but invariably mechanical methods will be brought into play. There are many terms that are used in the industry; scarification, verticutting and grooming have all been with us for many years.

Forms of aeration such as hollow coring could also be considered.

They do all have one thing in common; they disrupt the playing surface to a greater or lesser extent.

Disruption of the playing surface will affect the playability of the surface.

These operations should also be carried out when the environmental conditions are suitable.

Unfortunately this usually coincides with periods of better weather and subsequently more golfers and just maybe with an increase in the comments from the players about the "state of the greens".

Greenkeepers may suddenly find ourselves in a no win situation, the club don't want the work carrying out, because of the amount of play, whether from members or visiting parties. The greenkeeper may not want to do the work and face the comments about the greens. As for the initial problem, the thatch just continues to get worse and the putting surface quality is once again on the decline.

In conclusion, learn what causes thatch, learn how to deal with it without sacrificing the playability of the surface.

If thatch is a problem, there may need to be some changes.

But change is good. Remember, If we keep doing what we're doing, we're going to keep getting what we're getting.



ABOVE: Thatch should be regularly maintained through mechanical means along with top dressing, which will help dilute the organic matter layer.



LEFT: In low maintenance turf, thatch build-up occurs at a significant rate over a growing season. However, some thatch is good as it provides protection against moisture evaporation and resilience to wear and tear.

Aerator options



MAIN ABOVE: The Terrain Aeration Terralift injects air via 2.5cm probe and is claimed to send a blast of sufficient force to work down to around 1.0m. A Terralift can be used to inject dry materials to include dried milled seaweed, osmocote and slow release nutrients.

The increasing availability of sub-soil aeration techniques can literally breathe new life into tired turf. So before looking to strip off the old turf and starting again, consider if some form of aeration can help. James de Havilland writes

It would be unfair to single out any item of equipment as the ideal aeration tool. Not only a wide range of aeration systems, from slitters to air injection systems but an endless array of problems too.

So what follows is a general overview of some kit that is on offer with a general truism. If you are experiencing an aeration problem with your tees, greens or fairways, the chances are someone has been through similar problems too!

The **Wiedenmann Terra Spike** range comprises ten machines with widths spanning 1.35m to 2.1m with working depths of up to 220mm or 400mm depending on the model. As to work rates, this

can be as high as 9km/hr; fast enough to make fairway aeration feasible.

To help indicate a given models performance, Wiedenmann rank its models into XF for units able to work at a high forward speed, XD for extra deep, and XP for extra penetrative. Models with a G prefix are suitable for use on greens and other fine turf.

Terra Spike aerators have evolved to make it easier to set both working depth and, as applicable, the degree of heave. There is no need for tools either. As to tine changing, it should be possible to switch between different sets in around 15 minutes.

This is important as one machine can be employed for soil decompac-

tion and coring for soil exchange.

Launched in autumn 2009, the Wiedenmann GXi8 HD is interesting from a mechanical standpoint. Wear and tear is inevitable on all types of equipment, but it is how it is minimized that can really be of value. On the GXi8 HD, key moving parts to include springs and heave linkages are positioned behind covers at the front of the machine. The claim is that this keeps them out of the 'dirt zone' which in turn can help reduce wear and tear. As a bonus, it also helps to make the unit quieter too.

The centre of gravity is also closer to the tractor, a small point that in practice can really help stability. The tines on the GXi are closer to the



Groundsman Industries

Groundsman Industries deep tine aerators feature sealed bearings, to reduce maintenance, and have a shock absorbing system on the crank to help reduce noise and vibration. Tractor mounted models are offered in 1.2 and 1.8m working widths and can be fitted with a full range of solid and hollow tines.



Sisis

ABOVE: Up to 9 different types of tine, spaced at 150mm centres, can be fitted. Maximum working depth is a useful 127mm and the working width is 1,500mm.

INSET RIGHT: The Hydrovane compressor pump has its own integral cooling pack. Designed to deliver compressed air in demanding industrial applications, the pump is well within its operating capacity with the Aer-Aid system, delivering 88 litres per minute at a pressure of up to 10 bar.

eter. These can be set to operate as shallow as 25mm to 450mm (1 to 18in).

In itself, the drilling process is claimed to improve drainage by penetrating and piercing compacted layers in turf subsoil. By extracting material, lateral soil movement is also encouraged and this can allow re-establishment of capillary pore space in the root-zone area.

The drilled holes can also help improve rooting at the interface between turf and subsoil. Where turf has been laid over packed subsoil, it is unable to get adequate rooting and will tend to



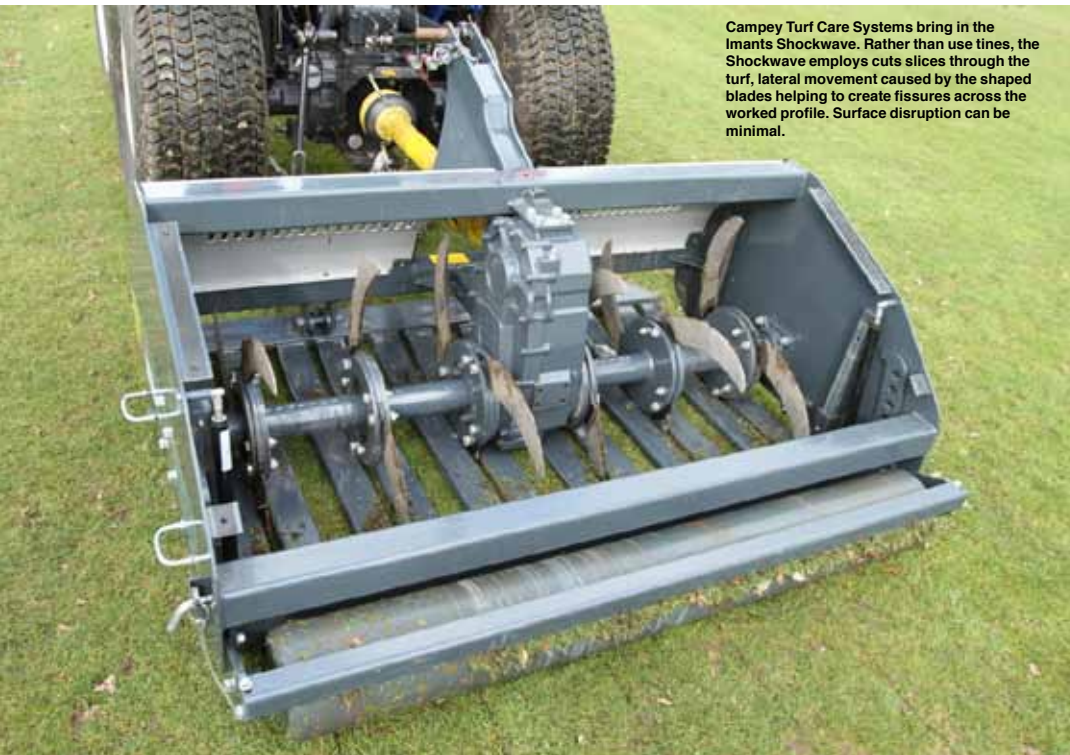
BELOW: Although developed to work on golf greens, the Wiedenmann GX18 HD is 'fast enough' to be worked over wider areas. Aerating approaches and compacted areas of fairways is just one of the uses to which such equipment can be put.

front roller too, this being claimed to ensure a uniform job on undulating greens. Further, although the machine is mainly designed for greens, tees and fine turf it will also cope on fairways which aren't built on rocky sub soils.

Ecosolve are specialist contract operators with the **Drill n Fill aerator** and Deep Drill 60/18 aerator. These two machines, which are also marketed by the company, are specifically designed to provide sub-soil aeration. The Drill and Fill is claimed by Ecosolve to be unique in its ability to not only create aeration ducts but also backfill them. This is carried out immediately, with materials that can be added including soil amendments, such as sand and gravel, nutrients or even bacteria.

In outline, the Drill n Fill drills 24 vertical ducts 30cm deep by 20mm in diameter over an area of 0.85m². The Deep Drill 60/18 aerator has 60 drill bits of 15 to 20mm diam-





Campey Turf Care Systems bring in the Imants Shockwave. Rather than use tines, the Shockwave employs cuts slices through the turf, lateral movement caused by the shaped blades helping to create fissures across the worked profile. Surface disruption can be minimal.

rest on the soil and not root. Holes drilled through the turf and into the subsoil will act as penetrable ducts into which turf roots can grow, fastening the loose top zone to the subsoil.

Where the Drill n Fill departs from standard drill type aerators is its ability to remove soil and replace it with fresh material. By adding sand, gravel or a specialist drainage medium, this process can also be used to make the drilled holes semi-permanent.

Another innovative aeration system is the Terralift aerator. This type of equipment works by blasting compressed air down into the subsoil, the sudden blast of air opening up fissures and helping to alleviate a range of subsoil problems including compaction.

A Terralift injects air via 2.5cm probe, and is worked on a staggered grid based on 2.0m centres. Said to send a blast of sufficient force to work down to around 1.0m, a Terralift can also be used to inject dry material. This can include dried milled seaweed, osmocote and slow release nutrients as well as various fungal and microbe-based materials.

The system can also be used to treat areas damaged by oil spills, sending in a bacterial formulation that can be used to digest oil within the soil. It is this type of specialist application that is often overlooked, with digging out problem areas typically being seen as the only answer.

As an aside, the Deep Drill 60/18 can also be used in conjunction with Terralift type equipment. Here, drilling in holes to perforate the surface before using the Terralift will prevent the compacted layer acting like a 'membrane'. This helps reduce surface uplift and is particularly useful when working on playing surfaces.

Based around its established Javelin vertical action aerator, the SISIS Javelin with Aer-Aid system uses compressed air to help relieve compaction in the rootzone of all types of sports turf. In simple terms, as well as pushing a hole into the turf with its tines, the Aer-Aid element also injects a blast of compressed air too. The aim is to offer a degree of additional decompaction right where it has most benefit.

Aeration is a fascinating subject. The adoption of existing equipment and new techniques continue to broaden the ways in which aeration can be used to help keep turf in good shape. Of equal importance, aeration can be used to rejuvenate tired turf economically.



The now ubiquitous Verti-Drain, from Charterhouse Turf Machinery, is designed to relieve deeper compaction. The pictured Verti-Drain 7521 has a 2.10m working width and can operate down to a depth of 400mm. A choice of hollow and solid tines are available.

Contacts

www.ecosolve.co.uk/golf.html
www.terrainaeration.co.uk/
www.sisis.com/golf/

Other aeration equipment suppliers include:

EP Barrus Ltd (MTD), Campey Turf Care Systems
 Charterhouse Turf Machinery Ltd
 DJ Turfcare Equipment Ltd
 Groundsman Industries

John Deere Ltd
 JSM Distribution
 Lloyds & Co Letchworth Ltd
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Around The Green



Scotland



Central

Congratulations to Craig Perry of the Dukes Course who leaves shortly to take up the position of Head Greenkeeper at South Staffs GC. Craig like a lot of guys in the area, was recently on a busman's holiday helping out at Castle Stuart for the Scottish Open. David Dukelaw also the Dukes and Fraser Robertson, St Andrews Links were in Paris helping out at the French Open. Michael Riddell, (St Andrews) was at the Irish Open, Derek Robson (Dukes) was at the US Women's Open and Phil Hind (St Andrew Links) was helping at Lytham for the Open Championship. It's fantastic to see our members being asked to assist in this way but perhaps they were all just hoping to escape this miserable weather we're experiencing. Our best wishes to all members who still have some large competitions to get through this season, it's been a hard slog so far. All I've heard these past few weeks is about the rough, pity the golfers at our Club's can't utilise the Professionals skills more and learn to hit the ball straight! Richard Windows of STRI is going to present at a seminar on the afternoon of 30 October prior to the AGM which will be held at Elmwood.

The Pairs competition is just starting the knock out stage and there will be new names on the trophy with last year's winners not qualifying from their group. Results are on the website www.biggacentralsection.org.uk where you will also find an entry form for the autumn outing at Piperdam. Hopefully Shaun Anderson, Course Manager at

Piperdam will be back to work by then following paternity leave. Congratulations Shaun on becoming a dad, you'll be up 22 hours a day now instead of the normal 20!

Gordon



North

As I am writing this report the weather for June and July has been awful and I stay hopeful that this weather will stop and we can get some heat. There has been some movement in the greenkeeping world. John Merchant is now Head Greenkeeper at Aspire Golf Centre and Stewart Brown has moved onto the Silverburn Course as First Assistant at Royal Aberdeen Golf Club, we wish them all the best in their new jobs.

Christopher Watson from Petercutter Golf Club has won Scottish Region Year 2 Award and also has been nominated for the Toro Student of the Year Award and we wish him all the best for this award.

I also have to say sorry for not posting the results from The Spring Outing at Royal Aberdeen. Better late than never so here are the results;

Nearest The Pin
Winner Gary McCandless, 8th Rigby Taylor
Winner Bob Hardie, 11th Craibstane Golf Club
Winner Josh Lester, 17th Longside Golf Club
Sweep
4th Neil Metcalf, Craibstane Golf Club
3rd Jocky Urquart, Rothes Golf Club
2nd Robert Paterson, Royal Aberdeen Golf Club
1st Neil Sadler, Portlethen Golf Club
Trade Winner
Pat Allen Symbio

Committee Winner
Robert Paterson, Royal Aberdeen Golf Club

Veterans
2nd Peter Boyd
1st Brian Cocker
Apprentice Trophy
Jack Craig, Royal Aberdeen Golf Club

Class 3
3rd Niall Bruce, Montrose Golf Club

2nd Steve Frost, Royal Aberdeen Golf Club

1st Scott Ribbeck, Kings Links Class 2

3rd Stewart Brown, Royal Aberdeen Golf Club

2nd Steve Macrae, Deeside Golf Club

1st Brian Cocker, Alyth Golf Club

Class 1
3rd Neil Metcalf, Craibstane Golf Club

2nd Douglas Elrick, Hazelhead Golf Club

1st Robert Paterson, Royal Aberdeen Golf Club

Scratch
2nd Jocky Urquart, Rothes Golf Club

1st Neil Sadler, Portlethen Golf Club

That's all for this month hope everything is going well for all of you.

Regards
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East

This year the summer months have failed to deliver any kind of weather resembling the summer's we've been used to and come to expect. The Links has more of a crop of grass than I have ever seen in June/July so the maintenance is full steam ahead day after day. All you

guys inland must be busy and with the demand on man and machine increasing there's no sign of any let up soon. Precipitation levels are through the roof together with humid conditions making disease a concern in weeks to come. Still it's all part of the challenge of being a Greenkeeper and it will be interesting to see what happens later in the season.

I've had many messages of sympathy that curiously resembles jokes about my football team (Rangers) It's tough time's for Gers fans but the jokes make it SO much easier to take (NOT!) Stop laughing Shaun Cunningham!!

Hopefully you've all had your summer update delivered to you. Thanks to Stuart Ferguson for that so see you all at Mortonhall GC for the Willie Woods Trophy. Do you have any interesting stories about the weather? Contact me s.crawford@live.co.uk or phone 07873464097 remember no more Gers jokes please!

Stewart Crawford



West

It is great to have such fantastic weather year on year, something we've come to expect of Scottish summer's, but how depressing is this summer? When can we get some sunshine again? Well as you can guess it's pretty awful weather in the West of Scotland with rain, rain and more rain, but I'm sure we can expect an Indian summer. First item on the agenda is the results from the spring outing held at Cardross Golf Club on 10 May. Surprisingly enough it was raining cats and dogs! Thanks to all the brave souls who made the day worthwhile by turning up to get drenched! Congratulations