

What is thatch?

This month, GI offers a beginner's guide to thatch, for those relatively new to greenkeeping. Thatch is all a question of balance, writes Dr Terry Mabbett. A more advanced look at thatch, is featured on pages 44-45



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.

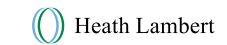
Many turf grass pathogens like ***Microdochium nivale* (Fusarium patch) and Colletotrichum (anthracnose)** have a quiescent or passive stage where they tick over on thatch as saprophytes and graduating into strong and aggressive parasites (feed on living tissue) when conditions are right. Simply put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

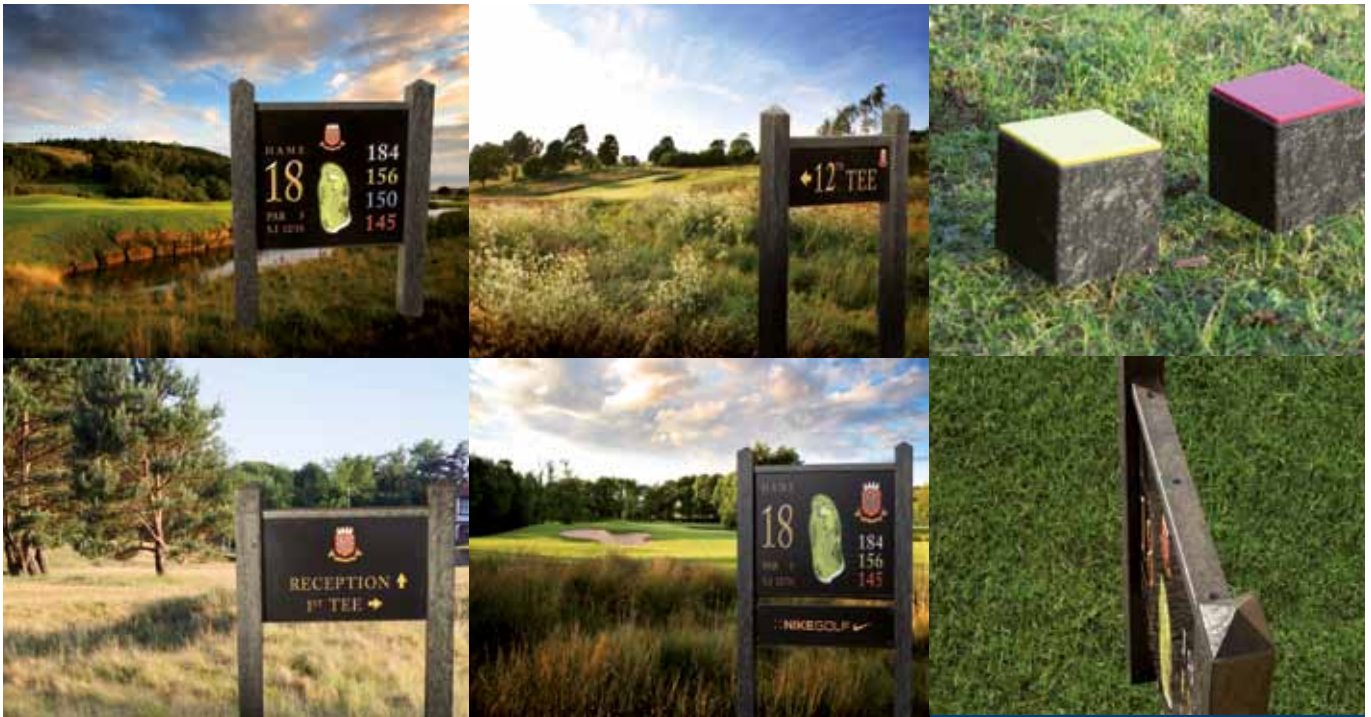
This will increase the ball roll distance in these zones, leading to a putting surface which has variability across the surface for ball roll. There will, therefore, be a variation in ball roll distance across the same green. Even without small greens high thatch levels may lead poor ball roll due to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

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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.